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ABSTRACT

This report details Vermont's Framework of Standards and Learning Opportunities, designed to provide a structure from which standards-based curricula can be developed, organized, implemented, and assessed; to provide the basis for the development of a comprehensive assessment system; and to make explicit what may be included in statewide assessments of student learning. The report is organized into four parts: (1) vital results standards; (2) fields of knowledge standards; (3) learning opportunities and examples of recommended practices; and (4) appendices. Vital results standards are the responsibility of all teachers and include educational objectives in the areas of communication, reasoning and problem solving, personal development, and civic and social responsibility. The fields of knowledge standards are specific to each subject field: (1) arts, language, and literature; (2) history and social sciences; and (3) science, mathematics, and technology. Within each section, standards are delineated for prekindergarten through Grade 4, Grade 5 through Grade 8, and Grade 9 through Grade 12. The report also describes learning opportunities to attain the standards, including examples of recommended practices. Four appendices answer common questions about the framework and its development, discusses issues relating to its use, and lists resources. (Contains approximately 120 references.) (KB)

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Vermont's Framework of Standards and Learning Opportunities

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Introduction

The purpose of Vermont's Framework of Standards and Learning Opportunities is to improve student learning. The standards will be used in three ways:

1. To provide a structure from which standards-based district, school, and classroom curriculum can be developed, organized, implemented, and assessed.
2. To provide the basis for the development of a state, local, and classroom comprehensive assessment system.
3. To make explicit what may be included in statewide assessments of student learning.

Statewide assessment will focus on students' use of knowledge and skills from the three fields of knowledge to attain the vital results.

Definition of Standards and Evidence

Standards identify the essential knowledge and skills that should be taught and learned in school. Essential knowledge is what students should *know*. It includes the most important and enduring ideas, issues, dilemmas, principles, and concepts from the disciplines. Essential skills are what students should be able to *do*. Skills are ways of thinking, working, communicating, and investigating. Standards also identify behaviors and attitudes related to success in and outside of school. These include (but are not limited to) providing evidence to back up assertions and developing productive, satisfying relationships with others. Frequently, standards are accompanied by evidence. The evidence is an indicator by which it can be determined whether or not the student has met the standards.

Definition of Learning Opportunities

Learning opportunities are recommended practices to support all students in attaining the standards in this framework. They address access, instruction, assessment, and connections, as well as best practices particular to the fields of knowledge. They represent areas that can be influenced by the teacher, and they are supported by current research and best practices. Examples of recommended practices follow each learning opportunity.

Organization of the Framework

The framework is organized in four main parts:

1. Vital Results Standards, which are the responsibility of teachers in all fields of knowledge;
2. Field of Knowledge Standards, which are specific to each field of knowledge and must be applied to attain the vital results;
3. Learning Opportunities and examples of recommended practices; and
4. Appendices, including questions and answers about how the framework was developed, and about issues relating to its use; and a bibliography.

As the work to build both state and national standards continues, these standards provide practical, useful reference points for the development of local curriculum and assessment. They are intended as points of reference, not as limitations. Many students will accomplish much more than these standards envision; yet the standards set the targets for what all students should be challenged, encouraged, and expected to achieve.

How to Read the Standards

Anatomy of the Standards

At the top outside corner of each page is the main section number and title. These can be referenced from the table of contents.

Each main section is subdivided into subcategories of standards. These are below a green horizontal line.

Reference title for the standard

The standard, what all students should know and be able to do. Each standard is preceded by a unique reference number which is listed in boldface in the vertical green band.

The evidence, when included, states how the standards can be demonstrated, and is listed by letter for each grade level cluster.

Grade level cluster

This phrase indicates that evidence listed under an earlier grade level cluster applies to this cluster as well.

Multiple letter listings indicate that an evidence is a development of a preceding evidence from an earlier grade level cluster.

2 Reasoning and Problem Solving Standards

PreK – 4	5 – 8	9 – 12

Questioning / Problem Solving

Types of Questions

2.1 Students ask a variety of questions. This is evident when students:

a. Ask questions about how things get done and how they work;
b. Ask questions to determine why events occur;
c. Ask questions that compare and contrast, to determine similarities and differences;
d. Ask questions that help make connections within and across fields of knowledge and/or between concepts; and
e. Ask reflective questions that connect new ideas to personal experience.

Evidence PreK – 4 applies, plus —

f. Ask critical evaluation questions that judge the quality of evidence from within a problem, text, work of art, etc.

Evidence PreK – 4 applies, plus —

ff. Ask critical evaluation questions that judge the quality of evidence from experts, evidence from other disciplines, etc.

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Overview of Vermont's Framework

The Vital Results

Communication

Reading
- Strategies
- Accuracy
- Comprehension
- Range of text

Writing
- Dimensions
- Conventions
- Responses to literature
- Reports
- Narratives
- Procedures
- Persuasive writing
- Personal essays

Listening
- Clarification
- Critique

Expression
- Speaking
- Artistic dimensions
- Notation and representation

Information Technology
- Research
- Informational sources
- Communication of data selection
- Simulation and modeling

Reasoning and Problem Solving

Questioning
- Comparing and contrasting
- Making connections
- Reflecting
- Evaluating

Solving Problems
- Process
- Types
- Effectiveness
- Mathematics dimensions

Persistence
- Application
- Information
- Taking risks
- Persevering

Abstract & Creative Thinking
- Fluency
- Elaboration
- Flexibility
- Product/service
- Plan/organize

Personal Development

Worth and Competence
- Goal-setting
- High-quality work
- Learning strategies
- Respect

Health
- Development
- Disease prevention
- Personal health
- Access to health resources
- Nutrition
- Fitness

Informed Decisions
- Evidence vs. opinion
- Personal economics
- Environment

Relationships
- Teamwork
- Interactions
- Conflict resolution
- Family systems

Workplace Skills
- Dependability and Productivity
- Career choices
- Transition planning

Civic and Social Responsibility

Service
- Serving others
- Democratic process

Diversity
- Cultural expressions
- Effects of prejudice
- Collaboration in community

Continuity and Change
- Personal and family changes
- Systemic changes
- Societal and cultural changes
- Environmental changes
- Historical changes

The Fields of Knowledge

Arts, Language, and Literature

Critical Response
- Eras and styles
- Times and cultures
- Aesthetic judgment
- Point of view
- Critique and revision
- Audience response

Literature and Media
- Types of literature
- American literature
- Diverse literary traditions
- Literary elements and devices
- Literate community response
- Design and production

The English Language
- Changes in language
- Conventions
- Structures of language

Non-Native Language
- Speaking and listening
- Reading
- Writing

Artistic Process
- Intent
- Critique
- Artistic problem solving
- Exemplary works
- Analysis
- Perspective

Elements, Forms, and Techniques
- Artistic proficiency
- Visual arts
- Music
- Theater
- Dance

History and Social Sciences

Critical Evaluation
- Causes and effects
- Evidence and data
- Interpretation
- Bias and propaganda
- Public issues

History
- Historical eras
- Concept of time
- Interconnection
- Community history
- Vermont history
- U.S. history
- World history
- Traditional/social

Geography
- Maps and globes
- Cultures and regions
- Settlements and ecosystems

Citizenship
- Rights and responsibilities
- Types of government
- Justice and equality
- Democracy

Diversity and Unity
- Concepts of culture
- Universal themes

Economics
- Economic systems
- Production, distribution, and scarcity

Conflicts and Conflict
- Resolution
- Social theory/problems
- National and international

Identity and Interdependence
- Identity construction
- Levels of identity

Science, Mathematics, and Technology

Inquiry, Experimentation, and Theory
- Scientific methods
- Investigation
- Theory
- Science and math history
- Roles and responsibilities

Mathematical Understanding
- Arithmetic, number, and operation concepts
- Geometry and measurement
- Function and algebra
- Statistics and probability

Mathematical Reasoning
- Applications
- Connections
- Generalizations

Systems
- Analysis
- Interdependence

Space, Time, and Matter
- Matter, motion, forces, and energy

The Living World
- Organisms and evolution
- The human body

The Universe, Earth, and the Environment
- Theories
- Systems
- Forces

Design and Technology
- Resource distribution
- Technological systems
- Outputs and impacts
- Designing solutions

The Vital Results

Vital results cut across all fields of knowledge. In the classroom, vital result standards are combined with field of knowledge standards. The following pages present standards for each of these vital results:

1. Communication

- Reads to understand and reads critically, to interpret a variety of materials.
  See standards for Reading, 1.1 — 1.4
- Writes effectively for a variety of purposes.
  See standards for Writing, 1.5 — 1.12
- Listens actively for a variety of purposes.
  See standards for Listening, 1.13 — 1.14
- Expresses self with power and purpose.
  See standards for Expression, 1.15 — 1.17
- Uses the tools of information technology to communicate.
  See standards for Information Technology, 1.18 — 1.22

2. Reasoning and Problem Solving

- Asks meaningful questions.
  See standards for Questioning/Problem Solving, 2.1
- Chooses and uses effective means of solving problems.
  See standards for Problem Solving, 2.2— 2.5
- Approaches problem solving with an open mind, healthy skepticism, and persistence.
  See standards for Approach, 2.6 — 2.9
- Thinks abstractly and creatively.
  See standards for Abstract and Creative Thinking, 2.10 — 2.14

3. Personal Development

- Develops a sense of unique worth and personal competence.
  See standards for Worth and Competence, 3.1 — 3.3
- Makes healthy choices.
  See standards for Healthy Choices, 3.4 —3.9
- Makes informed decisions.
  See standards for Making Decisions, 3.8 — 3.9
- Develops productive and satisfying relationships with others.
  See standards for Relationships, 3.10 —3.13
- Demonstrates the skills necessary to participate in the workplace.
  See standards for Workplace, 3.14 — 3.16

4. Civic / Social Responsibility

- Learns by serving others, and participates in democratic processes.
  See standards for Service, 4.1 — 4.2
- Respects and values human diversity as part of our multi-cultural society and world.
  See standards for Human Diversity, 4.3 — 4.4
- Understands continuity and changes
  See standards for Change, 4.5

1 Communication Standards

PreK – 4	5 – 8	9 – 12

Reading

Reading Strategies

1.1 Students use a variety of strategies to help them read. This is evident when students use a combination of strategies including:

PreK – 4

a. Sounds, syllables, and letter patterns (e.g., phonological, phonic, and graphic knowledge);
b. Syntax;
c. Meaning in context;
d. A range of cuing systems to discover pronunciation and meaning;
e. Self-correcting when subsequent reading indicates an earlier miscue;
f. Questioning; and
g. Prior knowledge of the topic and sense of story.

5 – 8

Evidence PreK – 4 applies, plus —

h. Predicting;
i. Skimming; and
j. Following themes.

9 – 12

Evidence PreK – 8 applies.

Reading Accuracy

1.2 Students read grade-appropriate material, with 90%+ accuracy, in a way that makes meaning clear.

Reading Comprehension

1.3 Students read for meaning, demonstrating both initial understanding and personal response to what is read. This is evident when students:

PreK – 4

a. Comprehend grade-appropriate materials;
b. Analyze and interpret features of a variety of types of text; and
c. Make connections among various parts of a text, among several texts, and between texts and other experiences in and out of school.

5 – 8

Evidence PreK – 4 applies, plus —

d. Make extensions/applications of a text;
e. Identify the textual structure and/or the technical, artistic, and literary conventions of text; and
f. Explain the meaning of various forms of representation (e.g., narrative, graphical, cartographic, symbolic, mathematical).

9 – 12

Evidence PreK – 8 applies, plus —

g. Analyze, interpret, and evaluate texts produced for a wide range of purposes and audiences, including their cultural, political, and aesthetic contexts.

Reading Range of Text

1.4 Students comprehend and respond to a range of media, images, and text (e.g., poetry, narrative, information, technical) for a variety of purposes (e.g., reading for pleasure as well as reading to develop understanding and expertise). This is evident when students:

PreK – 4

a. Read at least 25 books in a year, choosing high-quality materials from classic and modern literature and public discourse or their equivalent in magazines, newspapers, textbooks, media, and technical works;
b. Read at least three different kinds (genres) of printed materials and at least five different writers;
c. Read primary and secondary sources; and
d. Read at least four books (or book equivalents) about one issue or subject, or four books by a single writer, or four books in one genre, and demonstrate such reading through speaking, writing, or other appropriate means.

5 – 8

Evidence PreK – 4 applies.

9 – 12

Evidence PreK–4 applies.

Writing

Writing Dimensions

1.5 Students draft, revise, edit, and critique written products so that final drafts are appropriate in terms of the following dimensions:

Purpose	Intent is established and maintained within a given piece of writing.
Organization	The writing demonstrates order and coherence.
Details	Details contribute to development of ideas and information, evoke images, or otherwise elaborate on or clarify the content of the writing.
Voice or Tone	An appropriate voice or tone is established and maintained.

Writing Conventions

1.6 Students' independent writing demonstrates command of appropriate English conventions, including grammar, usage, and mechanics. This is evident when students:

a. Use clear sentences, correct syntax, and grade-appropriate mechanics so that what is written can be easily understood by the reader.

aa. Use correct grammar; employ a variety of sentence structures; follow conventional spelling; use correct mechanics; display few errors or patterns of errors, relative to length and complexity; make only intentional, effective departure from conventions.

Evidence aa. from 5 – 8 applies.

PreK – 4 | 5 – 8 | 9 – 12

Responses to Literature

1.7 In written responses to literature, students show understanding of reading; connect what has been read to the broader world of ideas, concepts, and issues; and make judgments about the text. This is evident when students:

Evidence PreK – 4 applies, plus —

- **a.** Connect plot/ideas/concepts to experience, including other literature;
- **b.** Go beyond retelling of plot by reflecting on what is read and making connections to broader ideas, concepts, and issues; and
- **c.** Support judgments about what has been read by drawing from experience, other literature, and *evidence* from the text, including direct quotations.

Evidence PreK – 8 applies, plus —

- **d.** Clearly articulate a point of view, or state a firm judgment about the piece to be discussed;
- **e.** Engage the reader effectively and provide closure; and
- **f.** Maintain a sense of audience by addressing the reader's possible questions.

Evidence PreK – 8 applies, plus —

- **g.** Establish interpretive claims and support them.

Reports

1.8 In written reports, students organize and convey information and ideas accurately and effectively. This is evident when students:

- **a.** Analyze a situation based on information gathered, and suggest a course of action based on the information; and
- **b.** Discuss a situation or problem, then predict its possible outcomes based on information gathered.

Evidence PreK – 4 applies, plus —

- **c.** Organize information gathered through reading, interviews, questionnaires, and experiments so that a reader can easily understand what is being conveyed;
- **d.** Establish an authoritative stance on a subject, and appropriately identify and address the reader's need to know;
- **e.** Include appropriate facts and details, excluding extraneous and inappropriate information; and
- **f.** Develop a controlling idea that conveys a perspective on the subject.

Evidence PreK – 8 applies, plus —

- **g.** Use a variety of strategies to develop the report; and
- **h.** Organize text in a framework appropriate to purpose, audience, and context.

Narratives

1.9 In written narratives, students organize and relate a series of events, fictional or actual, in a coherent whole. This is evident when students:

- **a.** Recount in sequence several parts of an experience or event, commenting on their significance and drawing a conclusion from them; or create an imaginative story with a clear story line in which some events are clearly related to the resolution of a problem;
- **b.** Use dialogue and/or other strategies appropriate to narration; and
- **c.** Select details consistent with the intent of the story, omitting extraneous details.

Evidence PreK – 4 applies, plus —

- **d.** Establish a situation/plot, point of view, setting, and conflict;
- **e.** Develop characters through action, speech, relationship to others, etc.; and
- **f.** Use a range of narrative strategies.

Evidence PreK – 8 applies, plus —

- **g.** Engage readers by creating a context that makes clear the significance of the story and of its central idea or tension;
- **h.** Control both the movement (chronology) and the pace of the story;
- **i.** Effectively use a range of narrative strategies;
- **j.** Effectively use dialogue; and
- **k.** Unify all narrative aspects of the story.

Procedures

1.10 In written procedures, students organize and relate a series of events, fictional or actual, into a coherent whole. This is evident when students:

- **a.** Organize the steps of procedures clearly and logically so the reader can follow them; and
- **b.** Use words, phrases, and sentences to establish clear transitions between steps.

Evidence PreK – 4 applies, plus —

- **c.** Make use, when necessary, of appropriate graphics to support text; and
- **d.** Anticipate what a reader needs to know in order to follow the procedures.

Evidence a., b., and d. applies, plus —

- **cc.** Use a variety of strategies and media (e.g., headers, graphics, tone, imagery) to ensure the message is user-friendly.

Persuasive Writing *(for grades 5-12)*

1.11 In persuasive writing, students judge, propose, and persuade. This is evident when students:

- **a.** Clearly define a significant problem, issue, topic, or concern;
- **b.** Make an assertion or judgment, or propose one or more solutions;
- **c.** Support proposals, as appropriate, through definitions, descriptions, illustrations, examples from experience, and anecdotes; and
- **d.** Engage the reader by anticipating shared concerns and stressing their importance, discussing the pros and cons of alternatives, and addressing the reader's potential doubts and criticisms.

Evidence 5 – 8 applies, plus —

- **e.** Take an authoritative stand on a topic;
- **f.** Support the statement with sound reasoning; and
- **g.** Use a range of strategies to elaborate and persuade.

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1 Communication Standards

PreK – 4	5 – 8	9 – 12

Writing *(continued)*

Personal Essays *(applies to grades 9 – 12 only)*

1.12 In personal essays, students write effectively. This is evident when students:

a. Establish a commonplace, concrete occasion as the context for the reflection;
b. Trace the process of reflection through a pattern of thinking; and
c. Maintain a precise, controlled, thoughtful voice and style.

Listening

Clarification and Restatement

1.13 Students listen actively and respond to communications. This is evident when students:

a. Ask clarifying questions;
b. Restate; and
c. Respond through discussion, writing, and using art forms.

Evidence PreK – 4 applies.

Evidence PreK – 4 applies.

Critique

1.14 Students critique what they have heard (e.g., music, oral presentation). This is evident when students:

a. Observe;
b. Describe;
c. Extend;
d. Interpret; and
e. Make connections.

Evidence PreK – 4 applies.

Evidence PreK – 4 applies.

Expression

Speaking

1.15 Students use verbal and nonverbal skills to express themselves effectively. This is evident when students:

a. Share information;
b. Use accepted conventions of the English language (e.g., grammar, usage, word choice, pronunciation) in formal settings (e.g., class presentations, job interviews);
c. Show awareness of an audience by planning and adjusting to its reaction;
d. Make effective use of such devices as pace, volume, stress, enunciation, and pronunciation;
e. Use language expressively and persuasively; and
f. Constructively express preferences, feelings, and needs.

Evidence PreK – 4 applies, plus —
g. Assume roles in group communication tasks.

Evidence PreK – 8 applies.

Artistic Dimensions

1.16 Students use a variety of forms, such as dance, music, theater, and visual arts, to create projects that are appropriate in terms of the following dimensions:

Skill Development	Projects exhibit elements and techniques of the art form, including expression, that are appropriate to the intent of the product or performance.
Reflection and Critique	Students improve upon products and performances through self-reflection and outside critique, using detailed comments that employ the technical vocabulary of the art form.
Making Connections	Students relate various type of arts knowledge and skills within and across the disciplines.
Approach to Work	Students safely approach their media, solve technical problems as they arise, creatively generate ideas, and cooperate with ensemble members where applicable.

PreK – 4	5 – 8	9 – 12

Notation and Representation

1.17 Students interpret and communicate using mathematical, scientific, and technological notation and representation. This is evident when students:

	Evidence d. applies, plus —	
a. Express ideas in a variety of ways (e.g., words, numbers, symbols, pictures, charts, tables, diagrams, models);	**aa.** Appropriately represent data and results in multiple ways (e.g., numbers and statistics, drawings and pictures, sentences, charts, tables, equations, simple algebraic equations, models);	**aaa.** Represent data and results in multiple ways (e.g., numbers and statistics, drawings, diagrams and pictures, equations, sentences, charts and tables, models), communicating points effectively;
b. Use appropriate scientific, technological, and mathematical vocabulary and representations, based upon prior conceptual work;	**bb.** Use appropriate scientific, technological, and mathematical vocabulary and representations to communicate simple and complex situations; and	**bbb.** Use appropriate scientific, technological, and mathematical vocabulary and formal symbolic notations to communicate simple and complex situations, with clear links between text and representations, symbolic notations and models, diagrams, graphs, etc.;
c. Use physical models to confirm and communicate relationships and concepts; and	**cc.** Use physical models to confirm and communicate relationships and concepts;	**ccc.** Use physical models quantitatively to confirm and communicate relationships and concepts; and
d. Explain a scientific, mathematical, or technological concept, explain a procedure they have followed.		**dd.** Explain a scientific, mathematical, or technological concept, explain a procedure they have followed to others in enough detail that others could repeat or reproduce the results.

Information Technology

Research

1.18 Students use computers, telecommunications, and other tools of technology to research, to gather information and ideas, and to represent information and ideas accurately and appropriately.

Informational Sources

1.19 Students use organizational systems to obtain information from various sources (including libraries and the Internet).

Communication of Data

1.20 Students use graphs, charts, and other visual presentations to communicate data accurately and appropriately.

Selection *(applies to grades 5 – 12 only)*

1.21 Students select appropriate technologies and applications to solve problems and to communicate with an audience.

Simulation and Modeling *(applies to grades 9 – 12 only)*

1.22 Students employ a variety of techniques to use simulations and to develop models.

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2 Reasoning and Problem Solving Standards

PreK – 4	5 – 8	9 – 12

Questioning / Problem Solving

Types of Questions

2.1 Students ask a variety of questions. This is evident when students:

a. Ask questions about how things get done and how they work;
b. Ask questions to determine why events occur;
c. Ask questions that compare and contrast, to determine similarities and differences;
d. Ask questions that help make connections within and across fields of knowledge and/or between concepts; and
e. Ask reflective questions that connect new ideas to personal experience.

Evidence PreK – 4 applies, plus —

f. Ask critical evaluation questions that judge the quality of evidence from within a problem, text, work of art, etc.

Evidence PreK – 4 applies, plus —

ff. Ask critical evaluation questions that judge the quality of evidence from experts, evidence from other disciplines, etc.

Problem Solving

Problem Solving Process

2.2 Students use reasoning strategies, knowledge, and common sense to solve complex problems related to all fields of knowledge. This is evident when students:

a. Use information from reliable sources, including knowledge, observation, and trying things out;
b. Use a variety of approaches to solve problems;
c. Justify and verify answers and solutions;
d. Identify patterns and connections;
e. Transfer strategies from one situation to others;
f. Implement an approach that addresses the problem being posed; and
g. Use manipulative, sketches, webs, etc. to model problems.

Evidence f. and g. applies, plus —

aa. Seek information from reliable sources, including knowledge, observation, and trying things out;
bb. Evaluate approaches for effectiveness and make adjustments;
cc. Consider, test, and justify more than one solution;
dd. Find meaning in patterns and connections; and
ee. Select and apply appropriate methods, tools and strategies.

Evidence bb., cc., dd, ee, f., and g. applies, plus —

aaa. Critically evaluate the validity and significance of sources and interpretations.

Types of Problems

2.3 Students solve problems of increasing complexity. This is evident when students:

a. Solve problems that are brief, clear, and concise; and
b. Solve problems in which the information needed for a solution can be organized within a simple system.

aa. Solve problems that require processing several pieces of information; and
bb. Solve problems that are related to diverse topics, including the less familiar.

aaa. Solve problems that require processing several pieces of information simultaneously;
bbb. Solve problems of increasing levels of abstraction and that extend to diverse settings and situations; and
c. Solve problems that require the appropriate use of qualitative and/or quantitative data based on the problem.

Improving Effectiveness *(applies to grades 5 – 12 only)*

2.4 Students devise and test ways of improving the effectiveness of a system. This is evident when students:

a. Evaluate the effectiveness of a system;
b. Identify possible improvements;
c. Test-run the improvements and evaluate their effects;
d. Make changes and monitor their effects over time;
e. Identify further possible improvements; and
f. Test-run and evaluate results.

Evidence 5 – 8 applies

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PreK – 4 | 5 – 8 | 9 – 12

Mathematics Dimensions

2.5 Students produce solutions to mathematical problems requiring decisions about approach and presentation, so that final drafts are appropriate in terms of these dimensions:

Understanding: Demonstration of understanding of the problem;
Approach: The strategies and skills used to solve the problem;
Reasoning: The reasoning used to solve the problem;
Observations and Extensions: Demonstration of observation, connections, application, extensions, and generalizations;
Mathematical Language: The use of mathematical language in communicating the solution;
Mathematical Representation: The use of mathematical representation to communicate the solution; and
Presentation: Presentation of the solution.

Approach and Reasoning: The strategies and skills used to solve the problem, and the reasoning that supports the approach;
Execution: The answer and the mathematical work that supports it;
Observations and Extensions: Demonstration of observation, connections, application, extensions, and generalizations;
Mathematical Communication: The use of mathematical vocabulary and representation to communicate the solution; and
Presentation: Effective communication of how the problem was solved, and of the reasoning used.

Approach

Application

2.6 Students apply prior knowledge, curiosity, imagination, and creativity to solve problems.

Information

2.7 Students respond to new information by reflecting on experience and reconsidering their opinions and sources of information.

Taking Risks

2.8 Students demonstrate a willingness to take risks in order to learn.

Persevering

2.9 Students persevere in the face of challenges and obstacles.

Abstract and Creative Thinking

Fluency

2.10 Students generate several ideas using a variety of approaches.

Elaboration

2.11 Students represent their ideas and/or the ideas of others in detailed form.

Flexibility

2.12 Students modify or change their original ideas and/or the ideas of others to generate innovative solutions.

Product/Service

2.13 Students design a product, project, or service to meet an identified need. This is evident when students:

a. Identify a need that could be met by a product, project, or service;
b. Justify the need and design the product, project, or service, researching relevant precedents and regulations; and
c. Evaluate the results.

Evidence PreK – 4 applies.

Evidence PreK – 4 applies.

Planning/Organization

2.14 Students plan and organize an activity. This is evident when students:

a. Develop a proposal for an activity, and obtain approval for it to take place;
b. Plan and organize all aspects of the event (with adult supervision PreK-4 & 5-8); and
c. Oversee all aspects of the event through to completion (with adult supervision PreK-4).

Evidence PreK – 4 applies.

Evidence PreK – 4 applies.

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3 Personal Development Standards

PreK – 4	5 – 8	9 – 12

Worth and Competence

Goal-Setting

3.1 Students assess their own learning by developing rigorous criteria for themselves, and use these to set goals and produce consistently high-quality work.

Learning Strategies

3.2 Students assess how they learn best, and use additional learning strategies to supplement those already used.

Respect

3.3 Students demonstrate respect for themselves and others.

Healthy Choices

Development

3.4 Students identify the indicators of intellectual, physical, social, and emotional health for their age and/or stage of development.

Healthy Choices

3.5 Students make informed, healthy choices that positively affect the health, safety, and well-being of themselves and others. This is evident when students:

a. Explain how childhood injuries and illnesses can be prevented and treated;

b. Describe relationships between personal health behaviors, alcohol, tobacco, and other drug use, and individual well-being; set a personal health goal, and track progress toward its achievement;

c. Demonstrate the ability to locate resources from home, school, and community that provide valid health information;

d. Recognize personal stress;

e. Demonstrate refusal skills to enhance health;

f. Wear seat belts when riding in vehicles, and a helmet when riding a bicycle; and

g. Can identify and classify foods according to the Food Guide Pyramid.

aa. Describe how lifestyle, pathogens, family history, and other risk factors are related to the cause or prevention of disease, injuries, pregnancy, and other health issues;

bb. Explain the relationship between positive health behaviors and the prevention of injury, disease, alcohol, tobacco, and other drug use, and premature death, and develop a personal plan for health;

cc. Demonstrate the ability to utilize resources from the home, school, and community that provide valid health information;

dd. Demonstrate use of strategies to manage stress;

ee. Demonstrate refusal and negotiation skills to enhance health, and to avoid potentially harmful situations;

ff. Wear seat belts when riding in vehicles, and a helmet when riding a bicycle;

gg. Explain the function of each group from the Food Guide Pyramid, and their relationship to health; and

hh. Demonstrate how to select a healthy diet that includes the recommended servings from the Food Guide Pyramid.

aaa. Describe how lifestyle, pathogens, family history, and other risk factors are related to the cause or prevention of disease, injuries, pregnancy, and other health issues;

bbb. Analyze how behavior can influence health maintenance, prevention of injury, disease prevention, and alcohol, tobacco, and other drug use prevention, and formulate a plan for lifelong health;

ccc. Demonstrate the ability to evaluate resources from home, school, and community that provide valid health information;

ddd. Assess personal health in terms of stress, and develop an approach or plan for managing stress;

eee. Demonstrate refusal and negotiation skills to enhance health, and to avoid potentially harmful situations;

fff. Wear seat belts when riding in vehicles, and a helmet when riding a bicycle;

ggg. Explain the function of each group from the Food Guide Pyramid, and their relationship to health; and

hhh. Evaluate their personal eating pattern for nutritional adequacy according to the concepts of the Food Guide Pyramid, using consumer resources such as food labels; and make suggestions for dietary changes if necessary.

Fitness

3.6 Students exercise regularly, demonstrating competence in many movement forms and proficiency in a few forms of physical activity. This is evident when students:

a. Exhibit concepts of space and body and a variety of movement skills during practice and activity; and

b. Exercise regularly — at least 30 minutes five or more times each week.

aa. Combine movement skills, and apply principles of movement to carry out skills performances appropriate for the intended performance; and

bb. Exercise regularly — at least 30 minutes five or more times each week.

aaa. Combine movement skills, and apply principles of movement to carry out skills performances appropriate for the intended performance; and

bbb. Develop personal training programs and effective practice procedures to achieve proficient performance in self-selected physical activities.

Making Decisions

Informed Decisions

3.7 Students make informed decisions. This is evident when students:

a. Seek information and base decisions on evidence from reliable sources, including prior experience, trying things out, peers, adults, and print and non-print resources; and

b. Evaluate the consequences of decisions.

Evidence PreK – 4 applies, plus —

c. Describe and explain their decisions based on evidence;

d. Recognize others' points of view, and assess their decisions from others' perspectives;

e. Analyze and consider alternative decisions; and

f. Differentiate between decisions based on fact and those based on opinion.

Evidence a., b., d., e., f. applies, plus —

cc. Describe and explain their decisions based on and logical argument.

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Personal Economics

3.8 Students demonstrate an understanding of personal economic decisions, and account for their decisions. This is evident when students:

a. Identify factors that influence their wants and needs; and
b. Use money to conduct accurate financial transactions.

Evidence PreK – 4 applies, plus —
c. Use economic reasoning when comparing price, quality, and features of goods and services.

Evidence PreK – 8 applies, plus —
d. Design a strategy for earning, spending, and saving personal financial resources; and
e. Use a system (e.g., savings, checking) to account for personal financial resources.

Environment

3.9 Students take steps to protect and repair the environment. This is evident when students:

a. Make informed personal decisions whose environmental impact they have considered.

Evidence PreK – 4 applies.

aa. Make informed decisions that balance natural-resource conservation with sustainable economic development.

Relationships

Teamwork

3.10 Students perform effectively on teams that set and achieve goals, conduct investigations, solve problems, and create solutions (e.g., by using consensus-building and cooperation to work toward group decisions).

Interactions

3.11 Students interact respectfully with others, including those with whom they have differences.

Conflict Resolution

3.12 Students use systematic and collaborative problem-solving processes, including mediation, to negotiate and resolve conflicts.

Roles and Responsibilities

3.13 Students analyze their roles and responsibilities in their family, their school, and their community.

Workplace

Dependability and Productivity

3.14 Students demonstrate dependability, productivity, and initiative. This is evident when students:

a. Attend school on a regular basis;
b. Complete assignments on schedule; and
c. Participate in classroom and group discussions.

Evidence PreK – 4 applies, plus —
d. Select the tools that are appropriate for academic and/or vocational tasks (with adult guidance).

Evidence a., b., and c. applies, plus —
dd. Independently select the tools that are appropriate for academic and/or vocational tasks.

Career Choices

3.15 Students know about various careers. This is evident when students:

a. Describe the types of work done by their parents or other members of the community.

aa. Collect information about careers, and experience careers directly or indirectly through classroom work and community experiences such as job shadowing, working with a mentor, or performing community service.

aaa. Collect information about specific careers, and experience these occupations directly or indirectly through classroom work, community work, and/or workplace experiences — such as job shadowing, working with a mentor, performing community service, apprenticeships, youth entrepreneurships, courses in technical centers, or community placements; and
b. Describe the historical and current impact of role stereotyping in the workplace.

Transition Planning *(applies to grades 5 – 12 only)*

3.16 Students develop a plan for current and continued education and training to meet personal and career goals. This is evident when students:

a. Make and carry out a plan for current and continued education and training to address individual and/or career goals.

Evidence 5 – 8 applies, plus —
b. Demonstrate how their education and training has provided them with the knowledge and skills to enter their chosen occupation or pursue further education and/or training.

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4 Civic / Social Responsibility Standards

PreK – 4	5 – 8	9 – 12

Service

Service

4.1 Students take an active role in their community. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Plan, implement, and reflect on activities that respond to community needs; and **b.** Use academic skills and knowledge in real-life community situations.	*Evidence PreK – 4 applies.*	*Evidence PreK – 4 applies.*

Democratic Processes

4.2 Students participate in democratic processes. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Students work cooperatively and respectfully with people of various groups to set community goals and solve common problems.	*Evidence PreK – 4 applies.*	*Evidence PreK – 4 applies.*

Human Diversity

Cultural Expression

4.3 Students demonstrate understanding of the cultural expressions that are characteristic of particular groups.

Effects of Prejudice

4.4 Students demonstrate understanding of the concept of prejudice, and of its effects on various groups.

Change

Continuity and Change

4.5 Students understand continuity and change. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Demonstrate understanding that change results from new knowledge and events; and **b.** Demonstrate understanding of the patterns of change (steady, cyclic, irregular) and constancy.	*Evidence b. applies, plus —* **aa.** Demonstrate an understanding that perceptions of change are based on personal experiences, historical and social conditions, and the implications of the change for the future.	*Evidence b. applies, plus —* **aaa.** Analyze personal, family, systemic, cultural, environmental, historical, and societal changes over time — both rapid, revolutionary changes and those that evolve more slowly.

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The Fields of Knowledge

Fields of knowledge support the vital results. Field of knowledge standards are specific to each field, and must be applied to attain the vital results. The following pages present standards for each of these categories:

5. Arts, Language, and Literature

- Critical Response
  See standards 5.1 — 5.7
- Literature and Media
  See standards 5.8 — 5.15
- The English Language
  See standards 5.16 — 5.18
- Non-Native Language
  See standards 5.19 — 5.21
- Artistic Process
  See standards 5.22 — 5.27
- Elements, Forms, and Techniques in the Arts
  See standards 5.28 — 5.37

6. History and Social Sciences

- Critical Evaluation
  See standards 6.1— 6.3
- History
  See standards 6.4 — 6.6
- Geography
  See standards 6.7— 6.9
- Citizenship
  See standards 6.10— 6.13
- Diversity and Unity
  See standards 6.14— 6.15
- Economics
  See standards 6.16— 6.19
- Conflicts and Conflict Resolution
  See standards 6.20— 6.22
- Identity and Interdependence
  See standards 6.23— 6.25

Note: The phrase various groups in the history and social sciences standards includes racial, ethnic, and gender groups, and various socioeconomic classes

7. Science, Mathematics, and Technology

- Inquiry, Experimentation,and Theory
  See standards 7.1 — 7.5
- Mathematical Understanding
  See standards 7.6 — 7.9
- Mathematical Problem Solving and Reasoning
  See standards 7.10
- Systems
  See standards 7.11
- Space, Time, and Matter
  See standards 7.12
- The Living World
  See standards 7.13 — 7.14
- The Universe, Earth,and the Environment
  See standards 7.15
- Design and Technology
  See standards 7.16 — 7.19

5 Arts, Language and Literature Standards

PreK – 4 5 – 8 9 – 12

Critical Response

Eras and Styles
5.1 Students demonstrate understanding of the historical eras, styles, and evolving technologies that have helped define forms and structures in the arts, language, and literature.

Times and Cultures
5.2 Students demonstrate how literature, philosophy, and works in the arts influence and reflect their time and their local and regional culture.

Universal Themes
5.3 Students discover universal themes by comparing a broad range of cultural expressions from various times and places.

Aesthetic Judgment
5.4 Students form aesthetic judgment, using appropriate vocabulary and background knowledge to critique their own work and the work of others, and to support their perception of work in the arts, language, and literature.

Point of View
5.5 Students develop a point of view that is their own (e.g., personal standards of appreciation for the arts, language, and literature).

Critique and Revision
5.6 Students review others' critiques in revising their own work, separating personal opinion from critical analysis.

Audience Response
5.7 Students respond constructively as members of an audience (e.g., at plays, speeches, concerts, town meeting).

Literature and Media

Types of Literature
5.8 Students read a variety of types of literature, fiction and nonfiction (e.g., poetry, drama, essays, folklore and mythology, fantasy and science fiction, and public documents, such as newspapers and periodicals).

American Literature
5.9 Students interpret contemporary and enduring works of American literature, and understand how important themes of American experience have developed through time.

Diverse Literary Traditions
5.10 Students interpret works of diverse literary traditions — including works by women and men of many racial, ethnic, and cultural groups in different times and parts of the world.

Literary Elements and Devices
5.11 Students use literary elements and devices— including theme, plot, style, imagery, and metaphor — to analyze, compare, interpret, and create literature.

Literate Community
5.12 Students participate as members of a literate community, talking about books, ideas, and writing.

PreK – 4 | 5 – 8 | 9 – 12

Responding to Text

5.13 Students respond to literary texts and public documents using interpretive, critical, and evaluative processes. This is evident when students:

a. Make inferences about content, events, story, characters, and setting, and about the relationship(s) among them; and
b. Explain the differences between various genres.

Evidence PreK – 4 applies plus —

c. Analyze the impact of authors' decisions regarding word choice and content;
d. Make inferences about themes and styles;
e. Describe how linguistic structures and the diverse features of language can influence interpretations of texts;
f. Identify the characteristics of literary forms and genres;
g. Explain the effects of point of view/bias; and
h. Evaluate literary merit.

Evidence PreK – 8 applies plus —

i. Make thematic connections between literary texts, public discourse, and media;
j. Evaluate the impact of authors' decisions regarding word choice, style, content, and literary elements; and
k. Interpret the ambiguities, subtleties, contradictions, ironies, and nuances.

Responding to Media

5.14 Students interpret and evaluate a variety of types of media, including audio, graphic images, film, television, video, and on-line resources. This is evident when students:

a. Analyze and interpret features of a variety of types of media;
b. Support judgments about what is seen and heard by drawing from experiences beyond the media, or by giving examples of conflicting messages in the media; and
c. Compare what is seen and heard in the media to their own lives.

Evidence PreK – 4 applies plus —

d. Make connections among various components of a media presentation (graphics, text, sound, movement, and data) and analyze how these components form a unified message;
e. Support judgments about what is seen and heard through additional research and the checking of multiple sources; and
f. Explain the effects of point of view/bias in the media.

Evidence PreK – 8 applies plus —

g. Evaluate the intents and effects of media messages.
h. Demonstrate an understanding of the economic and social impacts of various media as they have evolved historically.

Design and Production

5.15 Students design and create media products that successfully communicate.

The English Language

Changes in Language

5.16 Students demonstrate understanding of the ways in which the English language evolves and changes (e.g., word origins, impact of major events).

Dialects

5.17 Students respect diversity in dialects.

Structures

5.18 Students demonstrate an understanding of the structures of the English language (e.g., sentence, paragraph, text structure).

Non-Native Language

Speaking and Listening

5.19 Students speak and listen in a non-native language. This is evident when students:

a. Express personal ideas, feelings, and experience, using simple sentences.

Evidence PreK – 4 applies.

aa. Express thoughts in organized, meaningful ways, using correct vocabulary, structure, and usage.

Reading

5.20 Students read a non-native language. This is evident when students:

a. Read a variety of materials for meaning and information.

aa. Applies knowledge obtained from reading materials in a variety of situations.

Writing

5.21 Students write a non-native language. This is evident when students:

a. Write simple messages that are clear to the reader.

Evidence PreK – 4 applies.

aa. Write pieces in organized, meaningful ways, using correct vocabulary, structure, and usage.

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5 Arts, Language and Literature Standards

PreK – 4 | 5 – 8 | 9 – 12

Artistic Process

Intent

5.22 Students convey artistic intent from creator to viewer or listener.

Critique

5.23 Students critique their own and others' works in progress, both individually and in groups, to improve upon intent.

Artistic Problem Solving

5.24 Students solve visual, spatial, kinesthetic, aural, and other problems in the arts.

Exemplary Works

5.25 Students demonstrate knowledge of exemplary works in the arts from a variety of cultures and historical periods.

Analysis *(applies to grades 5 – 8 only)*

5.26 Students develop and present basic analysis of works in the arts from structural, historical, economic, and cultural perspectives.

Perspective *(applies to grades 9 – 12 only)*

5.27 Students combine perspectives to develop and present basic analysis of works in the arts, and they convey the ability to evaluate work in the various arts disciplines.

Note: See also related Vital Result Standards for Communication.

Elements, Forms, and Techniques in the Arts

Artistic Proficiency

5.28 Students use art forms to communicate, showing the ability to define and solve artistic problems with insight, reason, and technical proficiency. This is evident when students:

a. Use dance, music, theater, and visual arts to communicate.

aa. Communicate at a basic level in dance, music, theater, and visual arts.

aaa. Communicate proficiently in at least one art form

Visual Arts

5.29 Students use the elements and principles of two- and three-dimensional design in the visual arts, including line, color, shape, and texture, in creating, viewing, and critiquing.

5.30 Students use a variety of visual arts media (e.g., clay, tempera, watercolor, paper mache, animation, computer-aided design, video) to show an understanding of the different properties each possesses.

Music

5.31 Students use the elements of vocal and instrumental music, including rhythm, pitch, timbre, and articulation.

5.32 Students translate an idea into music notation or sound.

Theater

5.33 Students use aspects of voice – including volume diction, pause, tempo, and inflection — to enhance a role.

5.34 Students show awareness of audience and character through aspects of movement, including blocking, gesture, use of body, and motivation.

5.35 Students connect directorial and design choices to a script or role-play.

Dance

5.36 Students use dance vocabulary and locomotor movements (such as jump, leap, slide, skip) and axial movements (such as bend, twist, stretch) to show underlying movement skills such as alignment, balance, weight, shift, and elevation.

5.37 Students combine movement (in patterns using elements of space, time, and energy) with structural form (beginning, middle, end) to create a piece.

Note: See also related Vital Result Standards for Communication.

PreK – 4	5 – 8	9 – 12

Critical Evaluation

Causes and Effects in Human Societies

6.1 Students examine complex webs of causes and effects in relations to events in order to generalize about the workings of human societies, and they apply their findings to problems. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Evaluate issues, using at least two categories from these history and social sciences standards;	*Evidence PreK – 4 applies, plus —*	*Evidence b., c., and d. applies, plus —*
b. Identify multiple causes and effects for events under study; and	**aa.** Evaluate issues, using at least four categories from these history and social sciences standards.	**aaa.** Evaluate issues, using all eight categories from these history and social sciences standards.
c. Analyze specific events, make general observations about behavior in a human community (e.g., classroom, school, town, nation, world) based on these events, and apply those in proposing solutions for a persistent social problem.	**d.** Use knowledge of change and continuity in making decisions and taking action on public issues.	

Uses of Evidence and Data

6.2 Students understand the varied uses of evidence and data, and use both to make interpretations concerning public issues. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Analyze and evaluate the uses of evidence and data in conflicting interpretations; and	*Evidence PreK – 4 applies, plus —*	*Evidence PreK – 8 applies.*
b. Understand the differences and relationships among generalization, categorization, bias, and stereotyping, and their uses in the presentation and analysis of evidence and data.	**c.** Use statistical methodology to describe and interpret a broad range of societal issues (e.g., infant mortality, literacy rates, indicators of quality of life, the effects of government policies on various groups); and	
	d. Evaluate a public issue by tracing its origins, gathering and presenting data and other relevant evidence, and justifying the best resolution.	

Analyzing Knowledge

6.3 Students analyze knowledge as a collection of selected facts and interpretations based on a particular historical or social setting. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Differentiate among fact, opinion, and interpretation; and	*Evidence PreK – 4 applies, plus —*	*Evidence PreK – 8 applies.*
b. Analyze interpretations of events from the perspectives of various groups, and evaluate the credibility of differing accounts.	**c.** Recognize and evaluate the human tendencies to categorize, romanticize, or vilify individuals and groups through selected facts and interpretations; and	
	d. Identify and distinguish among the uses and forms (official and unofficial) of propaganda.	

History

Historical Connections

6.4 Students identify major historical eras and analyze periods of transition in various times in their local community, in Vermont, in the United States, and in various locations world wide, to interpret the influence of the past on the present. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Demonstrate understanding of different concepts of time, using calendars, interpreting alternate time models (e.g., linear vs. cyclical), various dating systems; and	*Evidence PreK – 4 applies, plus —*	*Evidence PreK – 8 applies, plus —*
b. Investigate the impacts, foreseen and unforeseen, of new knowledge and inventions (e.g., the knowledge of fire, the printing press, the cotton gin) on society as a whole and on various groups.	**c.** Identify the major historical eras in the location under study, their characteristics, and their influence on the present; and	**e.** Analyze and debate the two models of historical interpretation: historical contingency (historical results are not inevitable, different choices lead to different results), and history as teleology (history has a direction and purpose, e.g., Manifest Destiny).
	d. Analyze the causes and characteristics of periods of transition in the location under study, and their influences on the present.	

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6. History and Social Sciences Standards

PreK – 4	5 – 8	9 – 12

History *(continued)*

Traditional and Social Histories

6.5 Students investigate both the traditional and the social histories of the people, places, and cultures under study, including those of indigenous peoples. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Ask and offer conclusions concerning what history reveals about the humanness of both powerful and common people; **b.** Identify important individuals and groups involved in events under study, and analyze their impact; **c.** Describe and interpret events through the perspectives of people (both famous and common) living in the time and place under study; **d.** Demonstrate understanding of the relationships among powerful people, important events, and the lives of common people; and **e.** Identify and analyze the influence of various groups (e.g., ethnic, gender, religious) on major issues and events under study.	*Evidence PreK – 4 applies.*	*Evidence PreK – 4 applies.*

Being a Historian

6.6 Students use historical methodology to make interpretations concerning history, change, and continuity. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Collect and use primary resources (e.g., letters, diaries, artifacts, artwork, documents) in building original historical interpretations; and **b.** Use oral history methods and data to understand the ways in which people assign meaning to their own historical experiences.	*Evidence PreK – 4 applies, plus —* **c.** Use statistical methods and data collection to make interpretations, comparisons, and conclusions about scientific, governmental, social, and other changes in society; and **d.** Identify and analyze continuities in the midst of major change.	*Evidence PreK – 8 applies.*

Geography

Geographical Knowledge

6.7 Students use geographical knowledge and images of various places to understand the present, communicate historical interpretations, develop solutions for problems, and plan for the future. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Describe the physical and cultural geography and spatial organization of the time and place under study, and explain changes over time; **b.** Demonstrate mental mapping skills (e.g., putting people, places, culture groups, and ecosystems in their proper place; drawing maps from memory); and **c.** Use maps, globes, and other geographical images and tools for a variety of purposes, such as acquiring knowledge, making decisions, interpreting information, and analyzing perspectives.	*Evidence PreK – 4 applies, plus —* **d.** Identify, research, and interpret how geography influences historical and contemporary events; and **e.** Analyze land-use problems and suggest policies or models for the future, taking into account such issues as population growth, development, and environmental impact.	*Evidence PreK – 8*

Movements and Settlements

6.8 Students analyze the factors and implications associated with the historical and contemporary movements and settlements of people and groups in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Analyze and evaluate the causes, effects, processes, and patterns of human movements, both chosen and forced; and **b.** Demonstrate understanding of the processes, effects, and patterns of settlement.	*Evidence PreK – 4 applies, plus —* **c.** Use the concept of cultural regions to map such phenomena as artifacts, customs, languages, and to track the movements of people.	*Evidence PreK – 8 applies.*

Interrelationships

6.9 Students examine the interrelationships among physical earth processes, ecosystems, and human activities. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Locate and describe ecosystems in various times in Vermont, the U.S., and various locations around the world; **b.** Demonstrate how human actions modify the environment and may affect ecosystems; and **c.** Analyze how the physical environment affects human systems.	*Evidence PreK – 4 applies, plus —* **d.** Identify, contrast, and compare how the built environment reflects the natural environment, culture, and human needs; and **e.** Examine the interrelationships among earth's ecosystems, how change occurs in these relationships through natural and human activities, and the effects of these changes on human societies.	*Evidence PreK – 8 applies.*

Note: See also related Vital Result Standards for Civic/Social Responsibility.

PreK – 4 | 5 – 8 | 9 – 12

Citizenship

Meaning of Citizenship

6.10 Students examine and debate the meaning of citizenship and act as citizens in a democratic society. This is evident when students:

PreK – 4

a. Debate and define the rights, principles, and responsibilities of citizenship.

5 – 8

Evidence PreK – 4 applies, plus —

b. Analyze and debate the problems of majority rule and the protection of minority rights;
c. Analyze ways that individuals and institutions have narrowed the gap between the ideal (in national documents and symbols) and the actual in various times in their local community, in Vermont, in the United States, and in various locations world wide; and
d. Debate and define issues of justice and equality, including those that sometimes conflict (e.g., unequal treatment to correct past injustices; rules of war).

9 – 12

Evidence PreK – 8 applies.

Types of Government

6.11 Students compare and evaluate the philosophical underpinnings and the workings of different types of governments, including constitutional governments, in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

PreK – 4

a. Identify and evaluate the purposes of laws and rules, and the processes for making and changing them; and
b. Identify, compare, and evaluate the theories and principles of both limited and unlimited governments.

5 – 8

Evidence PreK – 4 applies, plus —

c. Identify and evaluate the stated purpose of the government under study, its perspective on individual rights and the common good, its opportunities for citizen participation, and its relations with foreign governments; and
d. Identify and analyze the relationship between statements of general principles of governing (e.g., the Declaration of Independence), and the means of implementing those principles (e.g., the Constitution).

9 – 12

Evidence PreK – 8 applies.

Institutional Access

6.12 Students analyze the access that various groups and individuals have had to justice, reward, and power, as those are evident in the institutions in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

PreK – 4

a. Examine community (e.g., classroom, school, town, nation) for fair treatment of all, regardless of ethnicity, class, gender, or religion.

5 – 8

Evidence PreK – 4 applies, plus —

b. Identify, compare, contrast, and evaluate the political and economic power of various groups; and
c. Analyze the influence that interest groups and public opinion have had on political, social, and economic life.

9 – 12

Evidence PreK – 8 applies.

Human Rights

6.13 Students identify and evaluate the concept of human rights in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

PreK – 4

a. Identify and compare how various societies have defined human rights; and
b. Identify and evaluate how actions (e.g., individual, group, national, international) promote or deny human rights.

5 – 8

Evidence PreK – 4 applies, plus —

c. Evaluate the impact of social choices (e.g., efforts to end hunger, finance health care, defend homelands) on human rights.

9 – 12

Evidence PreK – 8 applies.

Diversity and Unity

Concepts of Culture

6.14 Students understand the concept of culture, including the cultures of indigenous peoples, in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

PreK – 4

a. Define and identify the contemporary concept of culture recognized by anthropologists and ethnologists;
b. Compare a broad range of cultural expressions from both elite and folk groups (e.g., literature, art, artifacts, religions, and histories) to discover the variety among cultures; and
c. Investigate and use the formal and informal methods (e.g., photo albums, oral traditions) and institutions (e.g., family, schools, museums) that have been used to preserve and transmit culture.

5 – 8

Evidence PreK – 4 applies, plus —

d. Identify and analyze the changing roles and contributions of various groups (e.g., ethnic, gender, religious) within the society under study.

9 – 12

Evidence PreK – 8 applies, plus —

e. Identify and evaluate how changing definitions of culture and race have been used and misused by various groups.

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6 History and Social Sciences Standards

Diversity and Unity *(continued)*

Forces of Unity and Disunity

6.15 Students understand the tensions between the forces of unity and those of disunity in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

Evidence PreK – 4 applies, plus —

- **a.** Show that they understand the differences between homogeneity and diversity, and how both can cause community tensions and disunity, or can contribute to harmony and unity; and
- **b.** Identify and evaluate the benefits and stresses of diversity on a society (e.g., classroom, town, nation).
- **c.** Identify various subcultures within the society under study, and analyze the shared values and beliefs that hold them together; and
- **d.** Compare and contrast societies where diversity has led to either unity or disunity, and suggest lessons that can be learned about societal cohesiveness.

Evidence PreK – 8 applies.

Economics

Knowledge of Economic Systems *(applies to grades 5 — 12 only)*

6.16 Students identify the institutions that make up economic systems, and compare the bases of decision making within each system in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

- **a.** Identify the elements of various economic institutions in the time and place under study (e.g., workers, resources, costs, barter, markets, wages, waste products); and
- **b.** Show knowledge of the various institutions (e.g., families, clans, cooperatives, trading partners, unions, factories, banks, stock markets, multinational corporations) that make up the economic system under study.

Evidence 5 – 8 applies, plus —

- **c.** Analyze how changes in technology have historically affected the roles of workers, both paid and unpaid;
- **d.** Compare and contrast the decision making within economic systems as regards views on ownership, labor, prices, control and distribution of resources, and the values assigned to types of work, resources, and products; and
- **e.** Demonstrate understanding of the patterns and networks of economic interdependence that exist locally, nationally, and globally.

Impact of Economic Systems *(applies to grades 5 — 12 only)*

6.17 Students evaluate the impact of economic systems on the needs and wants of all people and on the environment in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

- **a.** Distinguish between needs and wants, and evaluate how both are met in various economic systems;
- **b.** Understand how choices within an economic system affect the environment in the local community and beyond; and
- **c.** Analyze the rules and laws governing technology and its use as they concern safety issues (e.g., worker safety, consumer health).

Evidence 5 – 8 applies, plus —

- **d.** Analyze how economic systems have fostered or discouraged individual liberties and the common good.

Applying Economic Knowledge *(applies to grades 5 — 12 only)*

6.18 Students apply economic knowledge to historical interpretation, to their own lives, and to the resolution of problems. This is evident when students:

- **a.** Use knowledge of limited resources, conditions of production, and waste disposal to make or analyze decisions about buying and using goods in various times and places (e.g., buying English tea during the American Revolution, making decisions about contemporary boycotts); and
- **b.** Identify influences on economic decisions — personally, nationally, and internationally.

Evidence 5 – 8 applies, plus —

- **c.** Apply understanding of the concepts of production, distribution, employment (including under- and unemployment), supply and demand, scarcity, and public/private sectors to historical and contemporary problems.

Governments and Resources *(applies to grades 9— 12 only)*

6.19 Students understand how governments affect the flow of resources, goods, and services. This is evident when students:

- **a.** Identify and analyze the meaning, uses, and effects of tariffs, free trade, boycotts, embargoes, currency, taxes, and monetary policies.

PreK – 4 | 5 – 8 | 9 – 12

Conflicts and Conflict Resolution

Nature of Conflict

6.20 Students analyze the nature of conflicts, how they have been or might be resolved, and how some have shaped the divisions in various times of their local community, Vermont, the United States, and the world. This is evident when students:

Evidence PreK – 4 applies, plus —

- **a.** Demonstrate an understanding of the tension between individuality and social conformity, and how that tension may lead to conflict;
- **b.** Identify and analyze how economic, gender, and cultural differences can contribute to conflicts, and propose ways to resolve such conflicts; and
- **c.** Identify and analyze specific conflicts (e.g., classroom, local, national, international), considering the conditions, motivations, and actions that led to them and how they could have been resolved differently.
- **d.** Analyze specific conflicts for their impact, considering how some have shaped geographic divisions in times in their local community, Vermont, the United States, and locations world wide; and
- **e.** Identify and evaluate the roles of technology and national and international organizations in contributing to conflicts and/or their resolutions.

Evidence PreK – 8 applies

Disruptions to Social Patterns *(applies to grades 5 — 12 only)*

6.21 Students identify, analyze, and evaluate disruptions to social patterns in various times in their local community, in Vermont, in the United States, and in various locations world wide. This is evident when students:

- **a.** Show understanding of how conflicts (e.g., revolutions, colonization, genocide) disrupt social patterns.

Evidence 5 – 8 applies

Conflict and Social Theory *(applies to grades 9 — 12 only)*

6.22 Students use concepts of conflict and social theory (e.g., group dynamics, social stratification, socialization forces) to create strategies for resolving persistent social problems. This is evident when students:

- **a.** Demonstrate understanding of societal pressures that lead to conflicts, analyze how humans have reacted to these pressures in the past, and offer ways to ease these pressures; and
- **b.** Use knowledge of social and conflict theories to identify and propose a solution for a persistent social problem.

Identity and Interdependence

Identity Changes

6.23 Students understand how changing societal roles and beliefs contribute to identity and role changes within the family and other social structures. This is evident when students:

Evidence PreK – 4 applies, plus —

- **a.** Identify their positions in time, space, and various groups, and analyze how these positions help to build identity; and
- **b.** Classify influences on identity (e.g., family, peer and kinship groups, occupation, ethnicity, social class, religion, and nationality), and analyze how these motivate behavior.
- **c.** Demonstrate understanding of how various groups build and preserve identity (e.g., ceremonies).

Evidence PreK – 8 applies

Identity Construction

6.24 Students understand the variety of influences on the construction and preservation of identity. This is evident when students:

- **a.** Demonstrate how societal changes (e.g., new jobs, changing gender roles, economic depressions, wars) can alter identities over time.

Evidence 5 – 8 applies

National Identity

6.25 Students understand the sources and characteristics of the national identity of the culture under study, and understand how competing identities may cause confrontations. This is evident when students:

Evidence PreK – 4 applies, plus —

- **a.** Identify the distinctive characteristics of a nation's identity; and
- **b.** Examine symbols, literature, histories, folk traditions, and myth for the sources of national identities.
- **c.** Analyze and evaluate how competing national identities and beliefs may lead to national and international conflicts.

Evidence PreK – 8 applies

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7 Science, Mathematics, and Technology Standards

PreK – 4 | 5 – 8 | 9 – 12

Inquiry, Experimentation, and Theory

Scientific Method

7.1 Students use scientific methods to describe, investigate, and explain phenomena:

Raise questions;

- Generate alternative explanations — hypotheses — based on observations and prior knowledge;
- Design inquiry that allows these explanations to be tested;
- Deduce the expected results;
- Gather and analyze data to compare the actual results to the expected outcomes; and
- Make and communicate conclusions, generating new questions raised by observations and readings.

This is evident when students:

	Evidence PreK – 4, plus —	*Evidence PreK – 8, plus —*
a. Ask questions about objects, organisms, and events in the world around them.	**aa.** Frame questions in a way that distinguishes causes and effects; identify variables that influence the situation and can be controlled.	**aaa.** Frame questions that can be investigated using scientific methods and knowledge, including manipulating variables, and predicting outcomes for untested hypotheses using scientific principles.
b. Use reliable information obtained from scientific knowledge, observation, and exploration;	**bb.** Seek, record, and use information from reliable sources, including scientific knowledge, observation, and experimentation;	**bbb.** Critically evaluate the validity and significance of sources and interpretations, including scientific knowledge, observation, and experimentation.
c. Create hypotheses for problems, design a "fair test" of their hypothesis, collect data through observation and instrumentation, and analyze data to draw conclusions, use conclusions to clarify understanding and generate new questions to be explored;	**cc.** Create hypotheses to problems, design their own experiments to test their hypothesis, collect data through observation and instrumentation, and analyze data to draw conclusions; use conclusions to clarify understanding and generate new questions to be explored;	
d. Use evidence to construct an explanation, including scientific principles they already know and observations they make;	**dd.** Describe, explain, and model, using evidence that includes scientific principles and observations.	**ddd.** Formulate and revise explanations and models based on evidence, logical argument, and scientific principles.
e. Explain a variety of observations and phenomena using concepts that have been learned;		
f. Use either deductive or inductive reasoning to explain observations and phenomena, or to predict answers to questions;		
g. Recognize other points of view, and check their own and others' explanations against experiences, observations, and knowledge;	**gg.** Propose, recognize, and analyze alternative explanations; and	**ggg.** Propose, recognize, analyze, synthesize, and evaluate alternative explanations; and
h. Identify problems, propose and implement solutions, and evaluate products and designs; and		**hh.** Identify problems and opportunities, propose designs and choose among the alternatives, implement a solution and evaluate its consequences.
i. Work individually and in teams to collect and share information and ideas.	**ii.** Work individually and in teams to collect, share, and present information and ideas.	

Investigation

7.2 Students design and conduct a variety of their own investigations and projects. These should include:

- Questions that can be studied using the resources available;
- Procedures that are safe, humane, and ethical;
- Data that are collected and recorded in ways that others can verify;
- Data and results that are represented in ways that address the question at hand;
- Recommendations, decisions, and conclusions that are based on evidence, and that acknowledge references and contributions of others;
- Results that are communicated appropriately to audiences; and
- Reflections and defense of conclusions and recommendations from other sources, and peer review.

This is evident when students:

a. Design and conduct an experiment (a "fair test");	**aa.** Design and conduct a controlled experiment;	
b. Design and conduct a systematic observation;	**bb.** Design and conduct field work;	
c. Complete a design of a physical structure or technological system (e.g., simple machines and measurement devices);	**cc.** Completely design a physical structure or technological system (e.g., spring scales, bicycle gear shifts, timing of traffic lights);	
d. Complete a data study;	**dd.** Complete a data study based on civic, economic, or social issues;	
e. Plan and manage a schedule;	**ee.** Design a resource or system management plan; or	
f. Complete a pure mathematics investigation; or	**ff.** Illustrate mathematical models of a physical phenomenon	**fff.** Complete a mathematical model of physical phenomena, employing methods of structural analysis;
g. Complete research		**h.** Study decision options in business or public planning that involve issues of optimizations, trade off, cost-benefit projections, and risks; or
		i. Complete a historical study, tracing the development of a mathematical or scientific concept and the people connected with it.

PreK – 4 | 5 – 8 | 9 – 12

Theory

7.3 Students understand the nature of mathematical, scientific, and technological theory. This is evident when students:

a. Show understanding that concepts form the foundation for theories;

b. Look for evidence that explains why things happen; and

c. Modify explanations when new observations are made or new knowledge is gained.

aa. Explain theories based upon observations, concepts, principles, and historical perspective;

bb. Determine the validity of a theory by examining the principles on which it was founded, the constraints that apply to its application, and the body of physical evidence that supports it; and

cc. Show understanding that new theories develop when phenomena are observed that are not fully explained by old theories.

Evidence bb and cc applies, plus —

aaa. Use principles and observations to formulate theory and to explain or predict phenomena.

History of Science, Mathematics, and Technology

7.4 Students understand the history of science, mathematics, and technology. This is evident when students:

a. Investigate contributions made to science, technology, and mathematics by many different kinds of people, and explain their importance.

aa. Examine important contributions made to the advancement of science, technology, and mathematics, and respond to their impact on past, present, and future understanding.

Evidence PreK – 8 applies.

Roles and Responsibilities

7.5 Students analyze the roles and responsibilities of scientists, mathematicians, and technologists in social, economic, cultural, and political systems. This is evident when students:

a. Explain how discoveries or inventions can help or hurt people (e.g., the environmental impact of energy consumption).

aa. Analyze the roles and responsibilities of scientists, mathematicians, and technologists in relation to ongoing research and discoveries that impact society (e.g., the dangers and benefits of nuclear energy).

aaa. Analyze the impact of scientific, mathematical, and technological investigations into and findings about human society, including the ethical issues involved (e.g., the dangers and benefits of genetic engineering).

Mathematical Understanding

Arithmetic, Number, and Operation Concepts

7.6 Students understand arithmetic in computation, and they select and use, in appropriate situations, mental arithmetic, pencil and paper, calculator, and computer. This is evident when students:

a. Add, subtract, multiply, and divide whole numbers, with and without calculators;

b. Begin to use simple concepts of negative numbers, properties of numbers (e.g., prime, square, composite), three-digit and larger multipliers and divisors, rates, and the relationship among fractions, decimals, and percents;

c. Describe and compare quantities by using simple fractions and decimals, and whole numbers up to 1,000,000;

d. Estimate, approximate, round off, and/or use exact numbers, as appropriate and necessary in calculation; and

e. Use knowledge of the place value system to solve problems.

Evidence d and e applies, plus —

aa. Consistently and accurately add, subtract, multiply, and divide rational numbers, and convert them into exponents;

bb. Interchange fractions, decimals, and percents; know that irrational numbers neither terminate nor repeat when written in decimal form;

cc. Show a sense of the magnitudes and relative magnitudes of numbers, and the helpful role of scientific notation;

f. Realize the inverse relationships between addition and subtraction, multiplication and division, and exponentiation and root-extraction;

g. Reason proportionally to solve problems involving equivalent fractions or equal ratios; and

h. Interpret percent as part of 100, as means of comparing quantities of different sizes, and as rate of change; order real numbers with the ">" and "<" relationships, and by location on a number line.

Evidence PreK – 8 applies, plus —

aaa. Understand and use number systems: natural, whole, integer, rational, real and complex;

bbb. Represent numbers in decimal or fraction form and in scientific notation, and graph numbers on the number line in the coordinate plane;

ff. Understand and use unitary operations (e.g., opposite, reciprocal, absolute value, raising to a power, taking a root, and taking a logarithm);

gg. Use dimensionless numbers (e.g., factors, proportions, and percents) and numbers with specific units of measure, including length, time, and rate units;

hh. Compare numbers using order relations, differences, ratios, proportions, percents, and proportional change;

ii. Understand the interrelationship of the four binary arithmetic operations, and use the properties of these operations in forming and working with algebraic expressions;

jj. Recognize and represent basic number patterns; and

kk. Show facility with the mechanics of unitary and binary operations, along with an understanding of their typical meanings and uses in applications.

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PreK – 4	5 – 8	9 – 12

Mathematical Understanding *(continued)*

Geometric and Measurement Concepts

7.7 Students use geometric and measurement concepts. This is evident when students:

PreK – 4	5 – 8	9 – 12
	Evidence f. and g. applies, plus —	*Evidence f. and g. applies, plus* —
a. Solve problems by showing relationships between figures (e.g., congruence, including flips, slides, and rotations);	**aa.** Model situations geometrically to formulate and solve problems; recognize rotational and bilateral symmetry in two- and three-dimensional figures;	**aaa.** Understand the properties of figures relating to shape, size, location, direction, and orientation;
b. Examine, compare, and analyze real objects and abstract figures by one-, two-, and/or three-dimensional features (e.g., angles);	**bb.** Understand the relationships, properties, and measures within and among one-, two-, and three-dimensional geometric objects;	**bbb.** Work with basic types of solid and plane figures, and with geometric patterns involving such figures;
c. Identify, classify, and name geometric figures by specific attributes and properties (e.g., symmetry);	**cc.** Identify similar and congruent shapes;	**ccc.** Use relationships between figures that involve congruence, similarity, projections, and transformations;
d. Begin to use simple concepts of scale (constant ratio), using combinations of units (e.g., m.p.h.), and the relationships between area, perimeter, and volume;	**dd.** Reason proportionally with measurements, to interpret maps and to make smaller- and larger-scale drawings, and	**ddd.** Use quotient measures (e.g., slope and "per unit" amounts) and product measures (e.g., person-days);
e. Select and use an appropriate unit (standard or non-standard) with which to measure, according to the properties, size, and use of the quantity to be measured;	**ee.** Recognize the differences between measures of length, area, and volume, and the corresponding uses of units, square units, and cubic units; measure angles, weights, masses, capacities, and times.	**eee.** Know, use, and derive formulas for area and volume of many kinds of figures;
f. Measure as exactly as possible or round off, as appropriate, and justify the choice; and		**fff.** Carry out unit conversions, scale changes, and dimensional analysis; competently use basic measurement instruments; understand issues of precision, accuracy, and error analysis;
g. Extend and create geometric patterns, concrete and pictorial models.		**h.** Understand the structure of standard measurement systems (SI and customary), including basic geometric and non-geometric measures;
		i. Analyze geometric figures and prove things about them using deductive methods; and
		j. Present graphs and figures.

Function and Algebra Concepts

7.8 Students use function and algebra concepts. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Extend patterns by identifying a rule that generates the pattern;	**aa.** Discover, describe, and generalize a variety of patterns mathematically;	**aaa.** Use functions to represent patterns;
b. Show how one quantity determines another quantity in a functional relationship; begin to use simple concepts of variables, including functional and proportional relationship, by representing them graphically (e.g., x-axis=time, y-axis=distance); and	**bb.** Understand variables in simple functions, especially linear and exponential functions; represent relationships with tables, graphs, and verbal or symbolic rules; analyze tables, graphs, and rules to determine relationships; and	**bbb.** Represent functional relationships in formulas, tables, and graphs, and translate among these; model given situations with functions, and interpret given functions in terms of situations; understand functions as relationships in which one quantity determines another; use basic types of functions (linear, exponential, periodic, power, rational, square, and square roots, and cubes and cube roots); work with properties and mechanics of functions (evaluation, inverse, slope, local maxima and minima);
c. Show that an equality relationship between two quantities remains true as long as the same change is made to both quantities.	**cc.** Explore solutions of unknown quantities in equations.	**ccc.** Define and use variables, parameters, constants, and unknowns in work with both functions and equations; solve equations both symbolically and graphically, especially linear, quadratic, and exponential equations; use equations to represent curves such as lines, circles, ellipses, parabolas, and hyperbolas;
		ddd. Understand the basic algebraic structure of number systems;
		e. Understand rate relationships in constant rate situations; and
		f. Use arithmetic and geometric sequences

PreK – 4	5 – 8	9 – 12

Statistics and Probability Concepts

7.9 Students use statistics and probability concepts. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Collect, order, display, and analyze data in order to answer a question or test a hypothesis;	**aa.** Create and interpret statistical tables and charts;	**aaa.** Explore questions of experimental design, use of control groups, and reliability;
b. Begin to use simple concepts of mean, median, and mode, along with various ways to represent data graphically;	**bb.** Appropriately use measures of central tendency — mean, median, and mode; understand the significance of frequency and distribution;	**bbb.** Work with normal distribution in some of its basic uses;
c. Gather data from an entire group or from a sample of its members, and identify the usefulness and limitations of each approach; analyze the validity of inferences about a set of data (i.e., figure out whether a statement is true or not); and	**cc.** Make conclusions and recommendations based on data analysis, and analyze the conclusions and recommendations of others;	**ccc.** Analyze single-variable data using frequency distributions, histograms, and summary statistics; analyze two-variable data using scatter plots, regression lines, and correlation coefficients;
d. Find all possible combinations, arrangements, and/or permutation within given constraints; predict outcomes and find out why certain outcomes are more likely, less likely, or equally likely.	**dd.** Make predictions based on experimental or theoretical possibilities; recognize equally likely outcomes and determine the probabilities of events; predict the results of a series of trials once the probability for one trial is known; and	**ddd.** Use experimental measures of likelihood based on gathering of data to arrive at relative frequencies of change events; use theoretical probability models to arrive at probabilities for chance events; use simulations to estimate probabilities; and
	e. Construct sample spaces.	**eee.** Set up and work with appropriate sample spaces; use sampling techniques to draw inferences about large populations.

Mathematical Problem Solving and Reasoning

Applications

7.10 Students use concrete, formal, and informal strategies to solve mathematical problems, apply the process of mathematical modeling, and extend and generalize mathematical concepts. Students apply mathematics as they solve scientific and technological problems or work with technological systems. This is evident when students:

PreK – 4	5 – 8	9 – 12
	Evidence a. and f. applies, plus —	*Evidence f. applies, plus —*
a. Solve problems by reasoning mathematically with concepts and skills expected in these grades;		**aa.** Formulate and solve meaningful problems in many kinds of situations using grade-related mathematical concepts and reasoning strategies;
b. Determine what the question, assignment, or problem is really asking them to do;	**bb.** Formulate and solve a variety of meaningful problems;	**bbb.** Formulate and carry out detailed solutions to complex problems, using appropriate problem-solving techniques;
c. Create and use a variety of strategies and approaches to solve problems, and learn approaches that other people use;	**cc.** Create and use a variety of approaches, and understand and evaluate the approaches that others use; determine how to break down a complex problem into simpler parts; extract pertinent information from situations;	**ccc.** Carry out a systematic analysis of different possibilities in a complex situation; create and test mathematical models of given situations; use basic principles of mathematical proof and reasoning in solving a variety of problems; identify interesting problems in a situation with minimal guidance, and pursue these problems by asking and answering appropriate questions;
d. Make connections between concepts in order to solve problems;	**dd.** Integrate concepts and techniques from different areas of mathematics;	**ddd.** Approach a relatively unfamiliar situation and explore its mathematically interesting aspects;
e. Extend concepts and generalize results to other situations; and	**ee.** Generalize solutions and strategies to new problem situations; and	**eee.** Work to extend specific results and generalize from them; and
f. Make sensible, reasonable estimates.	**g.** Formulate conjectures and argue (short of formal proof) why they must be or seem to be true.	**gg.** Gather evidence for conjectures and formulate proofs for them; understand the difference between supportive examples and proof.

Systems

Analysis

7.11 Students analyze and understand living and non-living systems (e.g., biological, chemical, electrical, mechanical, optical) as collections of interrelated parts and interconnected systems. This is evident when students:

PreK – 4	5 – 8	9 – 12
		Evidence PreK – 8 applies, plus —
a. Demonstrate understanding that systems are made of interrelated parts that influence one another;	**aa.** Demonstrate understanding that systems are connected to other systems, and that one system affects how others work;	**aaa.** Demonstrate understanding that analysis of systems is important to define and control inputs and outputs; and
b. Demonstrate understanding that systems include inputs, processes and outputs; and	**bb.** Demonstrate understanding that systems are effectively designed when specifications and constraints are understood; and	**bbb.** Demonstrate understanding that systems are effectively designed when specifications and constraints are understood; systems are optimized when efficiencies are maximized; and a system is never 100 percent efficient (entropy).
c. Use physical and mathematical models to show how, in a system, inputs affect outputs.	**cc.** Use physical and mathematical models to express how systems behave given a set of inputs or outputs.	

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7 Science, Mathematics, and Technology Standards

PreK – 4	5 – 8	9 – 12

Space, Time, and Matter

Matter, Motion, Forces, and Energy

7.12 Students understand forces and motion, the properties and composition of matter, and energy sources and transformations. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Sort objects and materials according to observations of similarities and differences of properties (e.g., size, weight, color, shape, temperature);	**aa.** Observe and measure characteristic properties of matter (e.g., boiling point, melting point, density, buoyancy, simple chemical reactions), and use them to distinguish one substance from another;	**aaa.** Observe and measure characteristic properties of, and chemical reactions between, one substance and another to distinguish between them; explain the structure of matter using the periodic properties of elements;
b. Observe and describe changes of states of matter (e.g., in water);	**bb.** Provide examples of substances reacting chemically to form new substances with different characteristics, and describe and model the phenomenon with reference to elements and compounds;	**bbb.** Demonstrate an understanding of the atomic structure of matter in relationship to the periodic table, bonding, elements and compounds; demonstrate an understanding of the conservation of matter; understand how radioactive elements decay (e.g., half life, alpha and beta emissions);
c. Observe and describe the behavior of gases in containers (e.g., pumps, balloons);	**cc.** Explain the relationships between pressure, volume, and the amount of gas (e.g., soda bottles, auto tires);	**ccc.** Quantitatively apply ideal gas laws; understand the concept of gas density;
d. Apply forces to objects (e.g., inertia, gravity, friction, push and pull), and observe the objects in motion;	**dd.** Observe and demonstrate a qualitative understanding of the relationship between mass, the magnitude of an applied net force, and the resulting change in speed and direction;	**ddd.** Use Newton's laws to explain quantitatively the effects of applied forces; observe, explain, and model object motion in a plane; qualitatively investigate conservation of momentum as it relates to collisions; and investigate the mechanics of rolling motion;
e. Identify and describe several common forms of energy (e.g., light, heat, and sound) and provide examples of sources, as well as some characteristics of the transmission (e.g., light travels in straight lines until it is reflected, refracted, or absorbed); and	**ee.** Identify and describe commons forms of energy (e.g., light, heat, sound, electricity, electromagnetic waves) and their attributes, sources, and transmission characteristics (e.g., radiation, convection, conduction of heat); and	**eee.** Provide examples of transformations of energy from one form to another; provide examples of conservation of energy; and understand that light and some particles have wave and particle properties (diffraction); and
f. Observe and record the effects of electric charge (e.g., charges repel, batteries); investigate magnetic and non-magnetic materials, and materials that are conductors and non-conductors of electricity.	**ff.** Investigate the relationship between electricity and magnetism (e.g., in electric motors).	**fff.** Understand that alternating magnetic fields generate electric fields, and vice versa (e.g. generators); discuss electromagnetic waves (e.g. radio waves, x-rays).

The Living World

Organisms, Evolution, and Interdependence

7.13 Students understand the characteristics of organisms, see patterns of similarity and differences among living organisms, understand the role of evolution, and recognize the interdependence of all systems that support life. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Identify characteristics of organisms (e.g., needs, environments that meet them; structures, especially senses; variation and behaviors, inherited and learned);	**aa.** Identify, model, and explain the structure and function (e.g., cells, tissues, organs, systems) of organisms (e.g. plants, animals, microbes), both as individual entities and as components of larger systems;	**aaa.** Demonstrate understanding of the uniqueness of the cell in different organisms (plants, animals, microorganisms) and the structures and functions of the cell (e.g., chemical reactions, diffusion of materials, direction by DNA of the synthesis of proteins, regulation, differentiation);
b. Categorize living organisms (e.g., plants; fruits, vegetables);	**bb.** Identify and use anatomical structures to classify organisms (e.g., plants, animals, fungi);	**bbb.** Demonstrate understanding of how biological organisms are classified into a hierarchy of groups and subgroups based upon similarities that reflect their evolutionary relationships (e.g., plants, animals, microorganisms);
c. Describe and show examples of the interdependence of all systems that support life (e.g., family, community, food chains, populations, life cycles, effects on the environment), and apply them to local systems; and	**cc.** Describe, model, and explain the principles of the interdependence of all systems that support life (e.g., food chains, webs, life cycles, energy levels, populations, oxygen-carbon dioxide cycles), and apply them to local, regional, and global systems; and	**ccc.** Describe, model, and explain the principles of the interdependence of all systems that support life (e.g., flow of energy, ecosystems, life cycles, cooperation and competition, human population impacts on the world ecological system), and apply them to local, regional, and global systems; and
d. Provide examples of change over time (e.g., extinction, changes in organisms).	**dd.** Describe evolution in terms of diversity and adaptation, variation, extinction, and natural selection.	**ddd.** Explain and justify how natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms.

PreK – 4 | 5 – 8 | 9 – 12

The Human Body

7.14 Students demonstrate understanding of the human body — heredity, body systems, and individual development — and understand the impact of the environment on the human body. This is evident when students:

a. Recognize that there are many similarities between parents and their children, some inherited and some learned;
b. Identify the parts of the human body, and demonstrate understanding of how the parts work together to perform functions that satisfy common needs;
c. Identify and describe environmental factors that can influence human health (e.g., exposure to microbes, pollution); and
d. Identify the pattern of human development.

aa. Describe how genetic information is passed through reproduction (e.g., genes, traits, chromosomes);
bb. Demonstrate an understanding of the human body systems for obtaining and providing energy, defense, reproduction, hormones, immunity, and coordination of physical functions;
cc. Provide examples of how the health of human beings is affected by their genetic makeup and environmental factors (e.g., exposure to microbes, pollution); and
dd. Identify and explain the human body's pattern of development.

aa. Explain and model how information passed from parents to offspring is coded in DNA molecules (e.g., gene mutations, gene combinations);
bb. Demonstrate an understanding that human beings have complex biochemical systems that enable them to function and reproduce (e.g., immunity);
cc. Analyze and describe how the health of human beings is affected by diseases passed through DNA, environmental factors, and activities that deliberately or inadvertently alter the equilibrium in ecosystems; and
dd. Identify, explain, and analyze the pattern of human development.

The Universe, Earth, and the Environment

Theories, Systems, and Forces

7.15 Students demonstrate understanding of the earth and its environment, the solar system, and the universe in terms of the systems that characterize them, the forces that affect and shape them over time, and the theories that currently explain their evolution. This is evident when students:

a. Identify and record evidence of change over time (e.g., erosion, weathering, fossilization);
b. Identify and record patterns and forces that shape the earth (e.g., geological, atmospheric);
c. Identify and record the interrelated parts of earth systems (seasons, time, weather, etc.);
d. Identify and record characteristics of our solar system (e.g., nine planets, order from sun, and movement of planets in relationship to the sun and moon; calendar); and
e. Analyze and explain natural resource management (e.g., properties and uses of earth materials: rocks, soils, water, fish, wildlife, plants, trees, and gases).

aa. Identify, record, and model evidence of change over time (e.g., earth's history: biological, geological);
bb. Identify evidence of, model, and explain the patterns and forces that shape the earth (e.g., atmospheric, geological);
cc. Identify, record, model, and explain the interrelated parts and connections between earth systems (e.g., crustal plates and land forms; atmosphere, water cycle, weather, and oceans);
dd. Identify, record, model, and explain the relationship of our solar system to the universe (day, year, season; sun, stars, galaxies; gravity, energy, orbits; planet characteristics);
ee. Analyze and explain natural resource management and demonstrate an understanding of the ecological interactions and interdependence between humans and their resource demands on environmental systems (e.g., waste disposal, energy resources, recycling, pollution reduction); and
f. Explain how modern views of the universe emerged (e.g., scientific theories, improved instrumentation).

aaa. Identify, record, model, and explain evidence of change over time (e.g., origin and evolution of the earth's biological, ecological, geological systems);
bbb. Identify evidence of, model, and explain the patterns and forces that shape the earth (e.g., geological and meteorological processes);
ccc. Identify, model, explain, and analyze the interrelated parts and connections between earth systems (e.g., sun, radioactive decay, and gravitational energy; weather and climate);
ddd. Identify, model, and explain the position of our solar system in the universe relative to distance and time (stars and star systems, fusion, instrumentation, and simulations; the universe as a hierarchy of interrelated systems);
eee. Analyze and explain natural resource management and demonstrate an understanding of the ecological interactions and interdependence between humans and their resource demands on environmental systems (e.g., production, consumption); and
fff. Explain the emergence of modern views of the universe (past, present, and future scientific theories).

Design and Technology

Natural Resources

7.16 Students understand how natural resources are extracted, distributed, processed, and disposed of. This is evident when students:

a. Recognize that steps need to be followed in extracting natural resources;
b. Identify the most appropriate materials for particular constructions;
c. Recognize that there are differences between natural and synthetic materials; and
d. Show that some materials can be reused and recycled, while others will be disposed of in landfills.

aa. Identify the steps that need to be followed when extracting natural resources;
bb. Select and use materials based on their properties, and on how they interact with other materials;
cc. Compare and evaluate products made of either natural or synthetic materials, or of a combination of the two;
dd. Demonstrate the ways that some materials can be reused, while others will be disposed in landfills; and
e. Identify how and why natural resources are unevenly distributed throughout the world, and how they are distributed through transportation.

Evidence dd. and e. applies, plus —
aaa. Choose effective methods for extracting specific natural resources;
bbb. Predict and evaluate how the characteristics of materials influence product design; and
ccc. Compare and evaluate products made of either natural or synthetic materials, or a combination of the two.

Design and Technology *(continued)*

Technological Systems

7.17 Students apply knowledge and understanding of technological systems to respond to a variety of issues. This is evident when students:

PreK – 4	5 – 8	9 – 12
	Evidence c. applies, plus —	*Evidence bb. and c. applies, plus —*
a. Describe the processes involved within each technological system (e.g., construction, power and transportation, communication, and manufacturing);	**aa.** Apply the basic processes involved within each technological system (e.g., construction, power and transportation, communication, and manufacturing);	**aaa.** Use and evaluate the processes involved within each technological system (e.g., construction, power and transportation, communication, and manufacturing); and
b. Recognize the basic inputs of all technological systems;	**bb.** Use the basic inputs of all technological systems; and	
c. Identify the outputs for each technological system; and		
d. Evaluate technological outputs, and recognize the changes necessary to improve the system.	**dd.** Evaluate technological outputs, and demonstrate the changes necessary to improve the system.	**ddd.** Evaluate complex technological outputs based on the original design specifications, and create modifications to improve that system.

Outputs and Impacts

7.18 Students understand that people control the outputs and impacts of our expanding technological activities in the areas of communication, construction, manufacturing, power and transportation, energy sources, health technology, and biotechnology. This is evident when students:

PreK – 4	5 – 8	9 – 12
	Evidence c. applies, plus —	*Evidence c. applies, plus —*
a. Understand that technology is a human endeavor;	**aa.** Demonstrate an understanding that people are able to share, compile, use, and misuse technology;	**aaa.** Assess ways that people are able to share, compile, use, and misuse technology;
b. Use tools to extend their capabilities; and	**bb.** Demonstrate how people create and use tools to observe, measure, create, and control; and	**bbb.** Invent and use tools that observe, measure, create, and control; and
c. Use tools and machines in a safe manner.	**d.** Identify the positive and negative consequences of technology (e.g., nuclear power for generating electricity).	**dd.** Propose a technological solution in which both the positive and negative consequences of technology are considered.

Designing Solutions

7.19 Students use technological/engineering processes to design solutions to problems. This is evident when students:

PreK – 4	5 – 8	9 – 12
a. Recognize that there are several steps in planning solutions to technological problems; and	**aa.** Create a design solution: Build on specifications, with an understanding of the constraints (e.g., cost, weight, environment), and tolerances that affect performance; Include mathematical and/or mechanical models of their design; Include steps and sequences for efficiently building a prototype that conforms to the specifications; Test the prototype; Use the results to modify the design; and	**aaa.** Create a design solution: Build on specifications, with an understanding of the constraints (e.g., cost, weight, environment), and tolerances that affect performance; Include mathematical and/or mechanical models of their design; Include steps and sequences for efficiently building a prototype or product that conforms to the specifications; Test the prototype; Use the results to modify the design; and
b. Recognize that several steps are usually involved in making things.	**bb.** Understand that the sequence in which these steps occur is critical to the efficiency and effectiveness of a solution.	**bbb.** Evaluate and adjust a design process, responding to the unique characteristics of a specific problem.

Learning Opportunities

Learning opportunities are recommended practices to support all students in attaining the standards in this framework. They address access, instruction, assessment, and connections, as well as best practices particular to the fields of knowledge. They are specific, they represent areas that can be influenced by the teacher, and they are supported by current research and best practices.

A. Access

- Content
- Instructors
- Resources
- Time
- Safe and Healthy Environment

B. Instruction

- Acquiring Knowledge and Skills
- Variety of Instructor Roles
- Multiple Student Roles
- Application and Reflection
- Adaptive Learning Environments

C. Assessment and Reporting

- Assessment and Reporting
- Multiple Assessment Strategies
- Criteria
- Using Assessments to Inform Instruction and Guide Student Learning
- Student Involvement in Assessment
- Effectively Communicating Assessment Information

D. Connections

- Interdisciplinary Connections
- Relevance
- Family and Community Collaboration

E. Best Practices

- Arts, Language, and Literature
- History and Social Sciences
- Science, Mathematics, and Technology

Learning Opportunities

To achieve the high standards presented in Vermont's Framework, every student needs:

A. Access

Content

A.1 Access to the knowledge and skills described in the standards Vermont's Framework. For example:

- **a.** Local curriculum based on the standards of Vermont's Framework.
- **b.** Concepts and skills based on Common Core standards that are woven throughout the grades, providing an opportunity to develop increasing levels of sophistication and understanding over time (e.g., understanding of atomic theory built on early explorations into the physical properties of objects).
- **c.** Units of study that are current, coordinated within the school (e.g., across classrooms and grade levels), and coordinated beyond the school (e.g., within the supervisory union).
- **d.** Opportunities to learn the concepts and skills identified in Vermont's Framework (e.g., physical science included at the primary level; use of a variety of arts media at the secondary level).
- **e.** Opportunities to read and write every day.

Instructors

A.2.1 Access to instructors who are knowledgeable about the disciplines they teach, about the developmental characteristics of the students they teach, and about best practices in learning and teaching. For example:

- **a.** Instructors planning developmentally appropriate curriculum and instruction.
- **b.** Instructors presenting their knowledge through multiple perspectives and connected disciplines (e.g., studying the Civil War from historical, economic, and literary perspectives).
- **c.** Instructors continually updating units of study to include new and revised information, current standards, and appropriate instructional strategies.

A.2.2 Access to instructors who share their knowledge, who work with others to plan and assess curriculum, and who themselves are continually learning. For example:

- **a.** Instructors participating in a variety of means of professional development to increase their knowledge of content and of learning and teaching (e.g., coaching, study groups, collaborative curriculum development, independent study).
- **b.** Instructors working with others (e.g., colleagues, parents, other community members, and students) to plan and assess curriculum.

Resources

A.3 Equitable and prompt access to accurate materials and current resources (in addition to textbooks) that are appropriate for learning goals. For example:

- **a.** Frequent opportunities to engage the community as a resource and a learning laboratory (e.g., learning from artists, businesses, health-care providers, town records, town meeting, community theater, the local landfill).
- **b.** Access to a variety of information-technology tools (e.g., computers, telecommunications).
- **c.** Access to all services provided within the school (e.g., guidance services, special education, speech and language support, health services, enrichment).
- **d.** Access to resource materials that are free of bias, stereotyping, and/or misrepresentation.
- **e.** Access to facilities and equipment necessary to support the instructional process.

Time

A.4 Instruction that uses time effectively and flexibly to achieve learning goals. For example:

- **a.** Schedules built around instructional needs (e.g., flexible blocks).
- **b.** Teacher input on external events or intrusions (e.g., timing of announcements, schedules, and special events) that have an impact on the day.
- **c.** Use of non-instructional time in creative and purposeful ways (e.g., taking lunch count in Spanish).
- **d.** Time built in for collaboration (e.g., student with teacher, teacher with teacher, teacher with family).
- **e.** Maximum time devoted to student "time on task," with high levels of student engagement in constructive learning tasks.

Safe and Healthy Environment

A.5 A physically and emotionally safe, educationally supportive environment in which to learn. For example:

- **a.** Equipment, work, and learning spaces maintained and organized so that tasks and projects may be carried out safely.
- **b.** Adults who are healthy and who model healthy behaviors (e.g., a smoke-free, drug-free environment).
- **c.** An environment in which each student has access to a caring adult.
- **d.** Policies and rules that are fair, known to all, and consistently applied.

B. Instruction

Acquiring Knowledge and Skills

B.1 Learning experiences that engage students in active learning, build on prior knowledge and experiences, and develop conceptual and procedural understanding, along with student independence. For example:

- a. Beginning learning experiences by setting a context and/or previewing possible applications.
- b. Strategies that help students link new learning to previous knowledge and experiences (e.g., discussion of previous experiences, free writes, pretests, "think-pair-share," three-minute pauses).
- c. "Scaffolding" of learning so that students can gradually gain expertise (e.g., removing cues over time as students learn to converse in a second language).
- d. Prompting of students to support their statements with evidence (e.g., while comparing, classifying, constructing support for positions).
- e. Strategies that help students organize and interpret new learning (e.g., having students create graphs and charts, graphic representations, flow charts, distributed practice sessions).
- f. Questions that extend and refine learning (e.g., open-ended questions, error-analysis questions).
- g. Opportunities for students to bring up and explore their own misconceptions, and to replace these with accurate conceptions of knowledge.

Variety of Instructor Roles

B.2 Teachers who use a variety of teaching roles (e.g., direct instruction, facilitating, modeling, coaching, reflecting, guiding, observing), and adapt these as appropriate for different purposes of instruction and student needs. For example:

- a. Teacher as explorer and co-learner.
- b. Instructor's role determined by the purpose of the learning and the needs of the students.
- c. Ongoing teacher collaboration in designing, implementing, and evaluating units of study.

Multiple Student Roles

B.3 Opportunities to learn through a variety of roles (e.g., planner, questioner, artist, scientist, historian), alone and with others. For example:

- a. Collaboration in both small and large groups.
- b. Students teaching other students, formally and informally.
- c. Pursuit of individual concerns, learning interests, and projects.
- d. Co-design (e.g., with teachers, peers) of learning activities.
- e. Opportunities for independent learning, work in pairs, and work in larger groups.

Application and Reflection

B.4 Projects and assignments that require students to integrate and apply their learning in meaningful contexts, and to reflect on what they have learned. For example:

- a. Extended investigations through which students address essential questions.
- b. Opportunities to transfer learning from one format or context to another.
- c. Experience with designing products, services, and systems.
- d. Student planning of activities, implementation of teaching-and-learning activities, and carrying out of projects that meet real needs.
- e. Use of in-depth applications (e.g., critiques, author studies).
- f. Opportunities for reflection through a variety of modes (e.g., writing, talking, dancing, painting).

Adaptive Learning Environments

B.5 Learning environments that are adapted so that all students achieve success. For example:

- a. Use of what is known from learning theory (multiple intelligence, learning styles, language development) to select appropriate instructional strategies.
- b. Instructors who assess students' needs and use that information to form groups, and to modify and adapt instruction.
- c. Collaboration among those involved with the child's learning experience (e.g., family members, teachers, health care providers, bus drivers) in order to meet student needs.
- d. An environment in which standards are the constant and time, strategies, and approaches are the variables, based on individual differences, strengths, and needs.

Learning Opportunities

C. Assessment and Reporting

Multiple Assessment Strategies

C.1 A balance and variety of assessment strategies, used to gain information and provide feedback about student learning (e.g., performance assessments, self-assessments, paper-and-pencil tests, checklists, etc.). For example:

a. Appropriate tools and techniques used for assessing different skills and concepts (e.g., anecdotal notes during observation of a discussion; a standards-based rubric used during a culminating project; formal assessments).

Criteria

C.2 Expectations and performance criteria are clear and public. For example:

a. Assessments clearly define student products and/or performances, and judge with observable criteria based on standards.

b. Public display of student work samples (e.g., on walls, bookmarks, newsletters, discussion at open houses) that illustrate identified criteria.

Using Assessment to Inform Instruction and Guide Student Learning

C.3 Assessment results that are used to influence instructional decisions and to plan the next learning steps for students. For example:

a. Classroom-based assessments that are embedded into instruction (e.g., assessment of prior knowledge about a topic, entries in learning logs).

b. Ongoing adjustment of instruction and of the classroom environment based on assessment (e.g., adding learning-teaching activities, selecting different materials, restructuring learning groups).

c. Appropriate use of tools such as performance checklists, scales, tests, and quizzes before, during, and after units of study.

d. Collaboration in assessment: gathering information from students, parents, other teachers, and/or community members to help build a more complete picture of student growth and achievement.

e. Students participate as appropriate in the development of performance descriptions.

Student Involvement in Assessment

C.4 Students use clear criteria and examples to evaluate their own work. For example:

a. Peer conferencing and self-reflection activities that use identified criteria (e.g., students setting criteria for assessment, or using rubrics to assess cooperative group activities).

b. Involvement by students in setting and monitoring progress toward learning goals.

Effectively Communicating Assessment Information

C.5 Classroom-based assessments that are combined with other measures to communicate information about student learning. For example:

a. Assessments that are summarized in relation to standards.

b. Clear communication and reporting about results to students, parents, and other professionals.

c. Communication of assessment information for clearly defined purposes: comparing student achievement against standards, demonstrating student growth over time, and public accountability.

d. Assessments that are fair, valid, and consistent (reliable).

e. Report cards that reflect student progress over time toward the standards, as well as student achievement of the standards.

f. Student involvement in parent conferences (e.g., reviewing the quality of work and setting goals).

g. Regular evaluations of how effectively assessments are being communicated (e.g., interviews with students, a survey of parents' responses to new reporting approaches).

D. Connections

Interdisciplinary Connections

D.1 Learning experiences that illustrate strong connections within and across the fields of knowledge. For example:

a. Direct experience with "real-world" questions, problems, issues, and solutions that are complex and that cross discipline boundaries (e.g., students design and build a nature trail using math skills, mapping, and principles of design), as opposed to contrived or superficial themes.

b. Application of skills learned in one discipline to other disciplines (e.g., questioning, estimation, and technical writing used in both social and physical sciences).

c. Investigation of problems that lend themselves to the scope of interdisciplinary work (e.g., study of rural economic development from social, economic, and environmental perspectives).

d. Opportunities to make connections among skills, content, and concepts within a discipline (e.g., vocabulary study connected with the history of the English language).

Relevance

D.2 Learning experiences that have personal, community, and/or global relevance. For example:

a. Thematic studies that allow students to draw connections between their lives and the world beyond the classroom (e.g., the study of immigration patterns in a local town; using the "outdoor classroom" to learn the natural heritage of a local community).

b. Involvement by students in the development of study units, and in pursuing their own questions to extend or focus a unit.

c. Service-learning experiences that are linked to classroom learning (e.g. writing a resource book for younger students).

d. Inclusion of multiple perspectives (e.g., analysis of the spotted owl issue from the perspectives of the environmentalist and the logger).

Family and Community Collaboration

D.3 An educational climate that is collaborative, in which school staff, families, health and human services personnel, and community members work together to support all learners. For example:

a. Ongoing, two-way communication with parents and community members: sharing of information, solving problems, and developing and discussing standards and criteria.

b. Access to family and community resources, including other social agencies (e.g., counseling provided during the school day), to support high performance by all learners.

c. Use of a variety of learning environments that are available in the community (e.g., libraries, lumber yards, shops, historical societies, forests, watersheds, hydroelectric dams).

d. Service-learning experiences that help students discover how communities work and their own role in them.

e. Connections across generations (e.g., mentoring, foster-grand parenting, taking oral histories).

f. Flexible scheduling of parent-teacher conferences, and use of home visits (as appropriate) to meet the needs of families.

g. Recognition and support of diverse languages and cultures (e.g., interpreters at parent-teacher conferences and open houses).

h. Proactive planning to make the school welcoming to all families and community members.

Learning Opportunities

E. Best Practices in the Fields of Knowledge

Arts, Language, and Literature

E.1 In addition to those presented in sections A-D, best practices specific to the arts, language, and literature include:

a. Emphasis on multiple artistic forms and techniques.
b. Emphasis on multiple reading strategies and comprehension.
c. Mini-lessons and individual student conferences based on students' diverse literacy needs.
d. Writing used as a tool for learning across the curriculum (e.g., learning logs, free writes, letters).
e. Opportunities to pursue literacy through personal interests (e.g., by self-selecting topics, materials, grouping patterns, books).
f. Respect and support for languages and dialects used in students' homes.
g. Teachers who set examples by reading, writing, and discussing their thoughts with others.

History and Social Sciences

E.2 In addition to those presented in sections A-D, best practices specific to history and the social sciences include:

a. Opportunities to participate in democratic processes in the school and community.
b. Partnerships and internship within the community.
c. Opportunities to collaborate with people of various cultures and social classes.
d. Access to national and international organizations with social science resources.
e. Opportunities to construct social, political, and economic systems.
f. Opportunities to report on research in various forms.

Science, Mathematics, and Technology

E.3 In addition to those presented in sections A-D, best practices specific to science, mathematics, and technology include:

a. Use of manipulative and scientific tools (e.g., calculators, microscopes, graphing calculators, computer simulations, tangrams) to engage students in active, in-depth learning (e.g., investigations, problem solving).
b. Frequent interactions with the natural world.
c. Inquiry, investigation, and experimentation as a regular part of the science program.
d. Frequent opportunities to use appropriate tools — including the senses — for observation and subsequent collection of data, including data that may not have been anticipated.
e. Frequent oral and written interactions between teachers and students, and among students, to develop and extend mathematical scientific thinking (e.g., discussions, presentations, learning logs, open-ended follow-up questions).
f. Flexible grouping for investigations, problem-solving tasks, research, and experimentation.
g. Teachers who display scientists' habits of mind.
h. Open-ended tasks that allow students to explore and/or analyze scientific, mathematical, and technological questions.
i. Assessment approaches that are embedded in instruction, and that require appropriate manipulative and scientific and technological tools.
j. Basic skills (e.g., measuring, recording, and computing) that are integrated with analysis, synthesis, and evaluation.
k. The opportunity for students to present the results of their investigations to their peers for review.

Questions and Answers about Vermont's Framework

What is the purpose of these standards?

Standards raise expectations for all learners. Vermont's Framework affects virtually everyone involved in Vermont public education, from prekindergarten through grade 12.

For Students
The standards make expectations for their performance clear to all students, who now can understand what they need to learn and be able to do. The standards can lead to improved performance at all levels; they promote challenging, equitable, and rewarding learning experiences for all learners.

For Teachers
In the effort to bring about change for dramatically heightened results in learning, teachers are the most important people. The standards will guide teachers as they design curriculum, instruction, and assessment around what is important for students to learn. This alignment of curriculum, instruction, and assessment is intentional.

For Districts and Schools
School innovations and district-wide programs for learning exemplify the standards in action. For all districts and all schools, the standards provide a focus for developing new ways of organizing curriculum content, instructional delivery systems, and assessment plans.

For Parents, Community Leaders, and Business people
The standards communicate shared expectations for learning. They provide a common language for talking about learning and teaching, and they make it possible for parents, business people, and community leaders to become more effective partners in young people's education. With standards in place, everyone can know what the goals of a good education are— and how students are progressing toward those goals.

For the State
The standards provide a common reference for ensuring that all the components of Vermont's educational system work together. They make explicit what may be included in statewide assessments of student learning. They make it clear — from district to district, and from school to school — what good learning is.

Who developed these standards?

In August 1993, the State Board of Education adopted Vermont's Common Core of Learning. Distilled from the results of more than 40 community focus forums and worked on by more than 4,000 Vermonters, the Common Core set forth broad areas of knowledge and skills that all learners need to succeed in the 21st Century. It specified vital results in four categories: Communication, Reasoning and Problem Solving, Personal Development, and Social Responsibility. It connected these with three fields of knowledge — the Arts, Language, and Literature, History and Social Sciences, and Science, Mathematics, and Technology — that learners must work with, learn about, and be able to use in order to attain the vital results.

Vermont's Framework of Standards and Learning Opportunities is the work of many people — teachers, school administrators, school board members, parents and community members, health and human services staff, business and higher education representatives, consultants, the staff of the Vermont Institute for Science, Mathematics, and Technology (VISMT), and the staff of the Teaching and Learning and School Improvement teams at the Vermont Department of Education. The standards and learning opportunities contained in this draft include the work of the following groups:

- The Vermont Arts, Language, and Literature Commission (formerly the Arts and Humanities Commission)
- The Vermont History and Social Sciences Commission
- The Vermont Science, Mathematics, and Technology Commission
- The Vermont Performance Standards Task Force
- The Vermont Learning Opportunities Committee (formerly the Effective Learning Experiences Committee)
- The Vermont Framework Steering Committee
- The New Standards Project

Questions and Answers about Vermont's Framework *(continued)*

How were the Standards developed?

The process of developing standards has been one of research and collaboration; of drafting, feedback, and revision. The three commissions listed above developed the initial draft standards by focusing on the question, "What from each field of knowledge is important for students to know and be able to do in order to attain the vital results?" As they worked, the commissions used drafts of national standards for the disciplines within their fields of knowledge, along with standards documents from other states, and other reference sources from various academic and professional groups.

Next, the Framework Steering Committee unified the drafts from the three commissions into one draft framework of standards. Public meetings were held and the draft was mailed to hundreds of Vermonters for comment. It was then revised based on the feedback received. Standards were deleted, added, revised, and edited to be clearer and more concise.

The second draft was also mailed out to a large number of Vermonters, as well as to national reviewers. It was reviewed by hundreds of teachers in workshops, courses, and curriculum development sessions, and it was shared with community members and school board members in information sessions. A performance standards task force also met during 1994-1995, to determine how the standards could be more clearly articulated to show the degree or quality of performance that was to be expected of students. Meetings were also held with the Vermont State Board of Education and the VISMT Board for critique and feedback, and subsequent revision, of the standards.

Finally, meetings were convened with staff members of the New Standards Project. The mission of New Standards is to design an assessment system based on world-class standards of student performance. The system is being built around advanced forms of assessment, including portfolios and timed, on-demand performance examinations. The projects performance standards are based on continuous review of national and international standards, and they include standards and student work samples from the United States and other countries. The New Standards performance standards have been reviewed by educators and content experts in the United States and other countries. Because Vermont is a partner in the New Standards Project, we have been able to reflect the New Standards performance standards — for English language arts, science, mathematics, and applied learning — in our standards.

Where will additional evidence come from?

Evidence will continue to emerge as the framework is used by teachers and students, and additional evidence can be included in the next refinement of the framework. Student products and performances will provide benchmarks for standards at each level, PreK-4, 5-8, and 9-12.

How will the standards be used?

The standards will be used in three ways:

1. To provide a structure from which standards-based district, school, and classroom curriculum can be developed, organized, implemented, and assessed.
2. To provide the basis for the development of a comprehensive assessment system.

   A comprehensive assessment system incorporates state, local, and classroom responsibility for assessment of student performance and access to learning across all three fields of knowledge, in relation to the vital results.
3. To make explicit what may be included in statewide assessments of student learning.

   Statewide assessment will focus on students' use of knowledge and skills from the three fields of knowledge to attain the vital results. Statewide assessment will focus on what students know and can do, not on how students should "be." Standards presented under the following vital results are best left to local decision making with regard to assessment, and will not be part of statewide assessment:

   - Reasoning and Problem Solving Vital Result: Approaches problem solving with an open mind, healthy skepticism, and persistence.
   - Personal Development Vital Result: Develops a sense of unique worth and personal competence.
   - Personal Development Vital Result: Develops productive and satisfying relationships with others.
   - Civic/Social Responsibility Vital Result: Respects and values human diversity as part of our multi-cultural society and world.

Decisions about assessment in these four areas are best left to local communities and classroom teachers as they develop their own curriculum and assessment plans.

Questions and Answers about Vermont's Framework *(continued)*

What is meant by "all students"?

This framework is intended to provide a structure for curriculum-building and assessment of student learning, and to raise expectations for every student. A very small percentage of Vermont students may not meet the standards set forth in this framework because of the extreme severity of their disabilities. An example might be a high school student with a severe disability who functions at a pre-school academic level. Accommodations for such students should be specifically addressed in their Individualized Educational Programs, within the spirit and context of what these standards intend.

By all students, we mean specifically (adapted from the National Council of Teachers of Mathematics, 1989):

- Students who have been denied access in any way to educational opportunities, as well as those who have not;
- Students who are female, as well as those who are male;
- Students who are African-American, Hispanic, Asian, American Indian, or members of other minorities, as well as those who are part of the racial or ethnic majority;
- Students who are socio-economically disadvantaged, as well as those who are more advantaged; and
- Students who have not been successful in school, as well as those who have been successful.

To invite and enable many more students to reach high standards of performance, we need to make changes in our schools. These changes will be many and difficult. Making them effectively requires that communities set high standards and hold themselves accountable for first-rate educational results for **all** students — no exceptions, no excuses.

How will the Framework be revised and refined?

As with any new document, the framework will need to be reviewed and refined. This review will focus on these questions:

1. Do any standards need to be changed, deleted, or added?
2. Does evidence need to be changed, deleted, or added?
3. Do learning opportunities need to be changed, deleted, or added?

This framework will be reviewed and refined according to the following schedule:

January 1997	Begin review after one year of implementation
June 1997	First refinement
January 1999	Begin review after three years of implementation
June 1999	Second refinement
January 2001	Begin review after five years of implementation
June 2001	Third refinement

Appendix B

How do the pieces fit?

5. Learning, Teaching, and Assessment

Teachers implement the local curriculum and assess student performance in ways that are consistent with the Vermont's Framework.

4. Local Curriculum

In order to achieve the standards in Vermont's Framework, the local school/district establishes a K – 12 curriculum and a process for student assessment. Local, state, and national influences include:

Local district- and school-level decisions by educators, students, parents, and community members.

Teacher-made learning materials and commercial materials.

Regional resources: cultural institutions, business partnerships, natural and built environments, etc.

Recommendations of professional organizations, national standards, and resources from other states.

A comprehensive assessment system.

3. Vermont's Framework

The Vermont Framework of Standards and Learning Opportunities includes:

Standards and Evidence:

Standards: What all students should know and be able to do.

Evidence: Statements of how the standards can be demonstrated.

Learning Opportunities:

The kinds of learning experiences that all students need.

2. Common Core of Learning

The basis of the framework is Vermont's Common Core of Learning — its vital results and fields of knowledge.

The Vital Results are grouped under:

Communication

Reasoning and Problem Solving

Personal Development

Social Responsibility

The Fields of Knowledge are:

Arts and Humanities

Social Sciences

Science, Mathematics, and Technology

Emerging Fields of Knowledge

1. The Green Mountain Challenge

The *Green Mountain Challenge* is Vermont's strategic plan for dramatically improving education. It states: "The education system needs to change because in order to succeed in their communities, in their homes, and in the adult workplace of tomorrow, *every* student will need higher skills than today's system is capable of helping them build. That is our vision: *high skills for every student, no exceptions, no excuses.*"

Definitions

Term	*Definition*	*Example*
Vital Results	Broad expectations of what students should know and be able to do.	Writes effectively for a variety of purposes.
Fields of Knowledge	The content areas that are combined and applied to achieve the vital results.	Arts, Language, and Literature History and Social Sciences Science, Mathematics, and Technology
Vital Result Standards	Specific statements of what ALL students should know and be able to do. These establish the degree and quality of performance that students are expected to attain within grades preK-4, 5-8, and 9-12.	Writing Dimensions Students draft, revise, edit, and critique written products so that final drafts are appropriate in terms of the following dimensions: *Purpose:* Intent is established and maintained within a given piece of writing. *Organization:* The writing demonstrates order and coherence. *Details:* Details contribute to development of ideas and information, evoke images, or otherwise elaborate on or clarify the content of the writing. *Voice or Tone:* An appropriate voice or tone is established and maintained.
Fields of Knowledge Standards	Standards that specify concepts, content, and skills within the fields of knowledge.	*Historical Connections:* Students identify major historical eras and analyze periods of transition in various times in their local community, in Vermont, in the United States, and in various locations world wide.

Standards for what the educational system should be able to do:

Learning Opportunities	Recommended practice to support all students in attaining the standards.	Units of study that are current, coordinated within the school (e.g., across classrooms and grade levels), and coordinated beyond the school (e.g., within the supervisory union).
Essential Characteristics of Assessment	Attributes that must be present for assessment to be valid, reliable, and meaningful.	Students should have multiple opportunities to meet standards, and should be able to meet them in different ways. Assessment results must be accompanied by information about the reliability and validity of the assessment instrument.
Sources of Evidence	Instructional activity, student product/performance, and the criteria for quality that are aligned to demonstrate attainment of a standard.	*Activity:* An analysis of a historical event from the perspectives of various groups. *Product/Performance: A written analysis* *Criteria:* Accuracy, relevance.
Assessment Criteria	The standards-based dimension(s) used to assess one or more aspects of student work. Sources of evidence and other effective assessments align the assessment criteria with instructional goals and with the most important aspects of student work.	*Standard:* In written responses to literature, students show understanding of reading, connect what has been read to the broader world of ideas, concepts, and issues, and make judgments about the text. *Criteria:* Responses, connections, judgments.
Performance Descriptions	Brief descriptions of two or more positions along the continuum identified by the criteria.	See the descriptions of each level in *The Vermont High School Mathematics Portfolio Scoring Guide and Benchmarks*
Scoring Guide or Rubric	The procedure used to assign scores or qualitative labels to student work. Includes the complete range of performance on the assessment criteria defined above. The range may be reported as continuous or divided into levels or categories. Complete performance assessment rubrics include benchmarks (examples of student work) to illustrate each level or category defined.	*The Vermont High School Mathematics Portfolio Scoring Guide and Benchmarks*; for a copy of this scoring guide, contact: Assessment Program Vermont Department of Education 120 State Street Montpelier, VT 05620 (802) 828-3112 or 828-5410
Performance Standards	The derived score or combination of scores required to document attainment of the standard, based on several examples of student work. A performance standard is usually set by an expert group on the basis of instructional goals, student performance data, knowledge of what students are capable of doing, and the intended use of the results.	Using the Vermont High School Mathematics Portfolio Scoring Guide, an expert group consisting of the Portfolio Design Group, other mathematics experts, and administrators will identify the score profile needed across best pieces in the mathematics portfolio to provide evidence that standard 2.4 has been demonstrated.

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Appendix D

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